Trustworthy and participatory community-based disaster communication: A case study of Jalin Merapi in the 2010 Merapi eruption in Indonesia

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Abstract

Less attention has been paid to the information receivers in disaster communication, particularly the way disaster information is considered to be trustworthy by the affected community and how it can increase collective participation in disaster communication, both at research and practice levels. Meanwhile, a lack of trust will prevent the transformation of information into usable knowledge for an effective disaster response because people are unlikely to pay attention and act on information provided by someone with whom they have a lack of trust. Thus, this study aims at gaining an in-depth understanding of community-based disaster communication by conducting a qualitative case study of Jalin Merapi (*Jaringan Informasi Lingkar Merapi* - Merapi Circle Information Networks) in the 2010 Mt. Merapi eruption with 35 in-depth interviews and 2 focus groups in Mt. Merapi surroundings. Data analysis was conducted with constructivist grounded theory in order to construct a theoretical understanding of how disaster communication is regarded as trustworthy and able to encourage collective participation. by the affected community, and the combined usage of traditional media and new media in disaster communication.

This thesis explains that the perception of the affected community of trustworthy and effective official communication is strongly related to the government's promptness in sharing complete and accessible official disaster information, and willingness to engage the affected community and their local knowledge. Thus, this thesis argues that the affected community is worth to be engaged in disaster communication for their culturally-embedded communication and tie strength of the social network, which can encourage trust and collective participation. In order to effectively facilitate community participation, disaster communication needs to engage multiple media, both the advanced internet-based and traditional media, based on the local communication behaviours. Moreover, this thesis details important roles of the affected community as reliable sources, couriers, and on-the-ground verifiers of local information about the needs of survivors and the affected areas during a disaster response. Finally, this thesis acknowledges the challenges of disaster communication with a bottom-up communication approach by involving local communities, based on their knowledge and vulnerabilities in responding to a disaster. Also, this thesis has a number of important implications for the future practice of disaster communication, especially in facilitating effective and trustworthy disaster information for the affected community.

Keywords: community-based disaster communication, trust, community participation, disaster response, Jalin Merapi, Merapi volcano.

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Abbreviations

APJII	Indonesian Internet Provider Association (*Assosiasi Penyelenggara Internet Indonesia)*
BBM	BlackBerry Messenger
BNPB	National Disaster Management Agency (*Badan Penganggulangan Bencana Nasional*)
BPBD	Regional Disaster Management Agency (*Badan Penanggulangan Bencana Daerah)*
BPPTKG	Center for Investigation and Technology Development of Geological Disasters *(Balai Penyelidikan dan Pengembangan Teknologi Kebencanaan Geologi)*
CCTV	Closed Circuit Television
Combine	Combine Resource Institution
CVGHM	Center for Vulcanology and Geological Hazard Mitigation *(Pusat Vulkanologi dan Mitigasi Bencana Geologi*)
DMAM	Disaster Management Audio Material
DRR	Disaster Risk Reduction
EM-DAT	Emergency Events Database
EOC	Emergency Operation Center (*Pos Komando Tanggap Darurat*)
ERP	Effective Radiated Power
ESDM	The Ministry of Energy and Mineral Resources of the Republic of Indonesia (*Kementerian Energi dan Sumber Daya Mineral*)
EWS	Early Warning System
HT	Handy-Talkie
IDP	Internally Displaced Person
IFRC	International Federation of Red Cross and Red Crescent Societies
ITU	International Telecommunication Union
Jalin Merapi	Information Network of the Merapi Circle (*Jaringan Informasi Lingkar Merapi*)
KRB	Hazard Zone (*Kawasan Rawan Bencana*)
MMC FM	Merapi Merbabu Community FM
NGO	Non-Government Organisations
OCHA	Office for the Coordination of Humanitarian Affairs
ORARI	Indonesian Amateur Radio Organisation
Pusdalop PB	Center of Disaster Management Operation Control *(Pusat Pengendalian Operasi Penanggulangan Bencana*)
SDIN	Sleman Disaster Information Network
SIKAD	Village Disaster Information System (*Sistem Informasi Kebencanaan Antar Desa*)
SMS	Short Message Service
VEI	Volcanic Explosivity Index
WHO	World Health Organisation
YM	Yahoo Messenger

Chapter One

Introduction: The information chaos in the 2010 Merapi eruption

Located in Indonesia, Mt. Merapi is one of the most active and hazardous volcanoes in the world (Mei et al., 2011, Surono et al., 2012, Troll et al., 2015); it erupts approximately every 4-6 years with varying intensity and magnitude (Surono et al., 2012). From 26 October to 30 November 2010, Mt. Merapi erupted continuously and ejected 130 million cubic metres of volcanic material (Sumarti et al., 2014). The 2010 eruption affected 1,335,885 residents living in four different districts in the areas surrounding Mt. Merapi, where more than 350 people died, 400,000 were displaced, and there were losses of US$ 300 million (Mei et al., 2011, Surono et al., 2012, Brown et al., 2015). Vulcanologists claimed that the 2010 eruption showed an unusual pattern of eruption (Brown et al., 2015), and was the mountain's most explosive eruption for more than 100 years (Mei et al., 2011, Surono et al., 2012, Sumarti et al., 2014). Being aware of the hazard of the volcano, the local communities living on the slopes of Mt. Merapi have been developing their indigenous knowledge of Mt. Merapi and participating in various workshops on disaster management to build their disaster capacities (Birowo, 2010). Despite an adequate level of community preparedness, the authorized contingency plans were not able to cope with the unexpectedly overwhelming scale of the 2010 eruption (Mei et al., 2011). Consequently, the local governments were not able to provide enough information for the affected community to be able to respond to the eruption effectively. Moreover, one of the national television stations reported misleading information that led to more chaos and casualties. The absence of essential information in the disaster communication made the disaster response more chaotic, increased distrust in the authorities, and created a demand for alternative trustworthy information sources besides the authorities and the mass media.

In any kind of disaster response, there is an increased demand for information from both affected and unaffected communities (Doan et al., 2012, Gao et al., 2011, Schellong, 2007, Spence et al., 2009, Tanner et al., 2009). People seek out and rely on trustworthy and accurate information to mitigate a hazard's uncertainty (Ferrante, 2010, Uslaner, 1999, Widén-Wulff et al., 2008). In order to fulfill a demand for trustworthy information, an affected community often turns to mass media, local government, or other community members as the dominant information sources in disaster response (Johnson, 2007). Yet, the

unpredictable nature of natural hazards may prevent the authorities from providing effective disaster communication. Similarly to the 2010 Merapi eruption, other extreme natural disasters (for example, the 1997 Red Valley flood (Hindman and Coyle, 1999), the 2004 Indian Ocean Tsunami (Harvard Humanitarian Initiative, 2011), and the 2005 Hurricane Katrina (Moody, 2013)) have showed that relying on the local government as the sole information source may be insufficient because of the possibility the authorities are overwhelmed with demands. Moreover, as also happened in the 2010 Merapi eruption, the mainstream mass media tend to take sides with particular parties for their own economic interest or exaggerate their information to promote their program ratings (Dougall et al., 2008, Gutteling and Dijkstra, 2012).

Thus, there is a strong risk that mass media and local government may lose their credibility as trustworthy and reliable information sources in a disaster response, as happened in the 2010 Merapi eruption. In this condition, community members turn to each other in seeking information they need to respond to a disaster effectively. However, the trustworthiness and the reliability of community-based disaster communication are still regarded as controversial both by researchers and emergency managers. Therefore, in order to gain an in-depth understanding about community-based information networks, this thesis is a case study of the role of Jalin Merapi (*Jaringan Informasi Lingkar Merapi* – Information Network of Merapi circle) during the 2010 Merapi eruption in Indonesia. Jalin Merapi is a trusted community-based network built on local person-to-person relationships and community participation, which could provide rapid and trustworthy information (BBC, 2012, IFRC, 2015). As this thesis will show, the Jalin Merapi network was considered trustworthy by the affected community; it was able to facilitate community participation in disaster communication, and it drove collective action in helping the victims, especially with volunteer help and direct distribution of aid.

This introductory chapter describes the focus on trustworthy and participatory community-based disaster communication. Starting with an explanation of the series of continuous eruptions of Mt. Merapi in 2010, this chapter outlines the specific context of disaster response that led to the usage of the Jalin Merapi network at that time. The chapter also provides the general background of the study regarding the vulnerability of Indonesia to various natural hazards, the vulcanology of Mt. Merapi, and the socio-cultural context of the local communities living in the area surrounding Mt. Merapi. After identifying several

research gaps in disaster communication, the chapter outlines the questions of this research in order to address the identified gaps and ends with an overview of the thesis.

1.1. The 2010 Merapi eruption

On 20 September 2010, increasing seismic activity (increasing ground inflation, earthquakes, increasing temperature, and gas release) led to the status of Mt. Merapi being elevated from "Normal" (Level I) to "*Waspada*" (Level II/ Advisory) indicating the possibility of a small to moderate eruption. On 21 October 2010, the status was increased to "*Siaga*" (Level III/ Watch) indicating the increased likelihood of an eruption. On 25 October 2010, Mt. Merapi's status was increased once again to *"Awas"* (Level IV/ Alert) indicating a high possibility of a large eruption. Consequently, the *Pusat Vulkanologi dan Mitigasi Bencana Geologi* (Center for Vulcanology and Geological Hazard Mitigation - CVGHM) declared a safety zone outside a radius of 10 kilometres from the Mt. Merapi summit. Further, the local government instructed the at-risk community living within a radius of 10 kilometres from the Mt. Merapi summit to evacuate (Mei et al., 2013, Mei et al., 2011, Sumarti et al., 2014, Surono et al., 2012).

As in previous eruptions, most of the local communities living in the at-risk areas were reluctant to evacuate because the mountain's spiritual gatekeeper Mbah Maridjan refused to leave at that time. The action of Mbah Maridjan was presumably based on the cultural belief that obliges the sacred elders, including the gatekeeper, to stay during an eruption in order to pray and ask the spirit to move the lava back to its original places in the river streams and cliffs (Triyoga, 1991). Unfortunately, some community members emulated his action and believed that the supernatural power of Mbah Maridjan would protect them from Mt. Merapi's hazards (Lavigne et al., 2008, Donovan, 2010, Donovan et al., 2012, Troll et al., 2015), regardless of the official instruction to evacuate. Others refused to evacuate for another reason, as explained by a community member below:

> We didn't know that Mt. Merapi could erupt so enormously. Never been that way before. When we were being told to evacuate, we thought that there was no way Mt. Merapi erupted in the way they [the local government] imagined […] We thought, "*ah, ra popo"* [ah, it will be fine] […] The local governments also didn't expect that the eruption would be so enormous, I think (Setiawan, personal interview, 5 June 2014).

Prior to the 2010 eruption, the local community had been repeatedly unresponsive, or even resistant, to the official instruction to evacuate. Part of the reason for this reluctance to heed the official warnings was likely to have been caused by the local volcanic mythology related to the traditional beliefs of the precursors of an eruption, the local socio-economic vulnerability of the local community including the reluctance to abandon livestock and livelihood, and the undermined trust in the official disaster response (Donovan, 2010, Donovan et al., 2012, Dove, 2008, Lavigne et al., 2008, Schlehe, 1996, Triyoga, 1991, Troll et al., 2015). The particular socio-cultural behaviour of the villagers on Mt. Merapi will be described in detail in the next subsection.

Only 35 hours after Mt. Merapi's status was increased to the highest level, it erupted explosively at 05:02 pm (local time) on 26 October 2010. The eruption produced a 12 km high ash plume, visible flame, bursts of volcanic material, and 8 km pyroclastic hot air flows from the southern part of Mt. Merapi (Sumarti et al., 2014, Surono et al., 2012). The first eruption forced the affected community to evacuate to the temporary Internally Displaced Persons (IDP) camps (*Tempat Pengungsian Sementara*). According to the National Disaster Management Agency (*Badan Penganggulangan Bencana Nasional* – BNPB), the first eruption resulted in 22,599 registered evacuees and 40 casualties, with the dead including spiritual gatekeeper Mbah Maridjan and those who remained behind with him (Donovan et al., 2012, Mei et al., 2013, Surono et al., 2012).

The Merapi volcano erupted explosively between 26 and 29 October 2010. On 30 October 2010, the volcanic activities increased as the volcanic ash reached 30 kilometres from the Merapi vent and 22-minute pyroclastic flows travelled to the southern parts of Mt. Merapi (Mei et al., 2011). At that time, the number of registered evacuees increased to 55,048 (Mei et al., 2013). However, the authorities officially declared their prediction that the volcanic activities of Mt. Merapi would decrease following the lava release (The Jakarta Post, 30 October 2010), which was later proven to be inaccurate as Mt. Merapi continued erupting. The mainstream mass media, particularly television, did not seem to be a reliable information source in reporting the increasing volcanic activities during the eruption. A national television channel inaccurately reported that the pyroclastic flows would reach areas within thirty kilometres from the Merapi summit. In fact, it was the volcanic ash that spread up to thirty kilometres away. A volunteer from the Jalin Merapi network explained that the inaccuracy apparently was caused by the lack of technical knowledge of the reporter to distinguish between the terminology of hot pyroclastic flows and volcanic ash (Sundary,

personal interview, 21 April 2014). As a result, the inaccurate report led to chaos and the loss of several lives in traffic incidents when people fled in panic. Consequently, some people rose up in protest and rejection of this information source; they picketed the particular national television channel and requested its reporters leave the surroundings of the Merapi volcano.

> TV One's news was exaggerated and DREADFUL!!! The reporter broadcasted that a hot pyroclastic flow was coming. It was just volcanic ash. There were lots of traffic accidents because people were panicking. Some died […] We, as Merapi refugees, committed to BOYCOTT AND REPEL THE TV ONE'S REPORTERS!!! WE DO NOT NEED THEM!!!!! (Prenanto, 2010).

On 3 November 2010, a new eruption of Mt. Merapi was three times larger than the first one. It sent up five-kilometre clouds of ash and gas continuously for more than an hour. After the explosion, volcanic tremors continued intensely and 38 pyroclastic flows occurred continuously reaching areas 12 kilometres away from the Merapi summit. Consequently, the CVGHM vulcanology centre extended the exclusion zones to 15 kilometres replacing the initial restriction of 10 kilometres, and recommended 32 villages in the Hazard Zone III (Kawasan Rawan Bencana - KRB) to evacuate (Mei et al., 2013; CBS News, 2010; Reuters, 2010a). The extension forced the local government to move the evacuees from the 10 kilometres-away-IDP-camps set up earlier. There were 76,031 registered evacuees and no casualties on that particular date (Mei et al., 2011, Surono et al., 2012).

On 4 November 2010, again, Mt. Merapi erupted continuously for 24 hours on a scale five times bigger than the 3 November eruption. At midnight, the eruption generated a 17 km altitude ash column and pyroclastic flows travelled 16 kilometres (15 km radial distance from the summit) to the western part of Mt. Merapi. On 5 November 2010, the authorities extended the exclusion zone into the areas within a radius of 20 kilometres from the summit in the southwestern and southern parts of Mt. Merapi. The flows claimed the lives of 367 people who had not evacuated or re-evacuated at that time (Surono et al., 2012). After the extension of the exclusion zone up to 20 kilometres from the summit, a massive exodus of evacuees moved down the Merapi slopes early on the morning of 6 November.

Unfortunately, the official instruction did not include a detailed list of which villages were included within the radius of 20 kilometres (Mei et al., 2013). The absence of information, consequently, created confusion among the Merapi people about whether they had to

evacuate or not. Moreover, there were many complaints about a lack of information about the destinations for re-evacuation because there were not enough IDP camps beyond the point of the 20 km exclusion areas. In addition to not being able to provide information about where to evacuate, the local government also could not provide information about how to re-evacuate for all the affected communities and the vehicles prepared by the local governments were not sufficient to accommodate all evacuees. Consequently, Wijoyono from Jalin Merapi, declared that most of the affected community re-evacuated randomly in panic, as they did not know where to go. He specifically stated:

> In the second big eruption, nobody knew where to re-evacuate […] Some IDP camps managed by the government had been directed to particular areas […] but, in general, they only followed their instincts […] They followed the crowds to get away from Merapi […] [They] just ran no matter where (personal interview, 17 March 2014).

Sharing his experience of the 2010 eruption, Mujianto, a volunteer from MMC FM, stated that the people from his village had to move eleven times in one night because there was no clear authorised instruction about the destinations for re-evacuation. He specifically stated:

> It was chaotic. We moved eleven times in one night because of inaccurate information […] At that time, there were not any officials on standby […] The local government didn't point out the evacuation points. They let us evacuate wherever we wanted to […] There were not any official IDP camps […] We were scattered for our own lives […] including the community leaders. A family was separated […] lost the other family members […] The 2010 eruption was our first experience of evacuating. Selo used to be less affected by a Mt. Merapi eruption compared to the western areas (personal interview, 26 April 2014).

At that time, the local authorities appeared to be overwhelmed because of the extensively affected areas and the large number of IDPs. Similarly to the community members, the authorities also experienced a chaotic disaster response and this was described by Yatin, a head of a village, and Kushartati, an officer of the Regional Disaster Management Agency (BPBD), as below:

> At that time, our efforts to seek and communicate with our residents were chaotic. We couldn't communicate with our own residents […] We could not ensure whether our residents were safe or not (Yatin, focus group, 19 July 2014).

> The scale of the eruptions was unpredictable. Actually, we had been informed that the eruption was going to be big, but we didn't know how big it was going to be (Kushartati, focus group, 19 June 2014).

There were at least 600 IDP camps scattered in several districts of Central Java province and Yogyakarta province (Mei et al., 2011) and many of them were unofficial. An officer of the Magelang government stated that the government agencies had to focus on the permanent IDP camps and could not cover the unofficial and temporary ones; they were not able to record the refugees who were outside the official IDP camps. As a result, the local authorities lost track of the number of evacuees and faced difficulties in distributing assistance (Mei et al., 2013). Similarly, Iman, a district officer told his story:

> [A] head of a village lost his villagers. A husband didn't know where his wife was evacuated to […] Everything was uncoordinated […] Some had too much aid, some had a lack [of aid]. When they needed rice, they got eggs […] It really happened in the Notoyudan sub-district (focus group, 19 July 2014).

Many evacuees experienced unprepared IDP camps with inadequate facilities, lack of food and clean water, and sanitation issues (Lie, 2012). According to an interviewed community member, this situation was worsened because of a lack of knowledge about emergency preparedness bags on the part of the evacuees; they tended to evacuate without bringing anything and totally relied on logistic aid from outsiders. He explained:

> Where should we have gone? How? […] We just ran! […] We didn't know the evacuation routes…We re-evacuated three times on foot […] Until now, we didn't know where the IDP camps were […] We just knew that the [downwards sloping] roads were the evacuation routes […] We just knew that we had to run and reach it [the nearest IDP camp]. After we reached it, that was it! […] Nobody took care of us […] The IDP camps were not ready yet […] We were only accommodated without any further management […] It happened several times […] We did not bring anything with us when we evacuated […] The most important thing is information. Whom should we ask what we need? What should we do as evacuees? We didn't know whom to ask (Setiyoko, personal interview, 8 July 2014).

Responding to the overwhelmed local authorities, the Indonesian President, Susilo Bambang Yudhoyono, declared that the 2010 Merapi eruption was a national disaster. Therefore, he designated the National Disaster Management Agency (BNPB) to manage the disaster response. Referring to the Regulation of the Head of BNPB Number 14 (2010), the BNPB

took responsibility for the regional disaster management by establishing *Pos Komando Tanggap Darurat* (Emergency Operation Center - EOC) in Yogyakarta city located approximately 30 km away from Mt. Merapi.

On 6 November, the eruption became less intensive, although Mt. Merapi's status still remained at the Alert level with occurrences of pyroclastic flows and lava (Sumarti et al., 2014, Surono et al., 2012). Starting from 13 November 2010, the exclusion zone was gradually reduced for the four affected districts (Mei et al., 2011) and on 3 December 2010, the status of Mt. Merapi was decreased to the Alert stage (Level III) (Sumarti et al., 2014, Surono et al., 2012), and the eruptive activities subsided. Although Mt. Merapi stopped erupting, the volcanic hazards did not stop. By February 2011, the 150 million cubic metres of volcanic mudflow had turned into 282 massive lahars and destroyed 215 houses, damaged 463 houses, took away 12 bridges and 20 sabo-dams[1], and flooded some major roads (Lie, 2012, Surono et al., 2012).

In the 2010 Merapi eruption, the absence of adequate official information and inaccurate news reporting led to distrust in the mass media and the local governments. The distrust simultaneously encouraged a critical demand for alternative information sources from the Merapi communities, particularly from their internal social networks. In responding to the demand, the broadcasters of five community radio stations located on the slopes of Mt. Merapi decided to use their pre-existing community-based network called the Jalin Merapi network for acquiring and sharing trustworthy information about the survivors in all affected districts in the area surrounding Mt. Merapi. The community radio stations were Lintas Merapi FM in Klaten district, K FM in Magelang district, Merapi Merbabu Community (MMC) FM in Boyolali district, Gema Merapi FM in Sleman district, and Lahara FM in Magelang district. This thesis shows how the Jalin Merapi network was used to counter any misleading news from the national television, foster the process of official information sharing in order to reach villagers in remote critical areas, and share specific local information about the affected community during the 2010 Merapi eruption. The Jalin Merapi network was able to trigger and facilitate community participation to help the affected

[1] The structures of Sabo-dams have been performing the functions of damming the rivers prone to lahar and decelerating the discharge of lahars in the area surrounding Mt. Merapi since 1970s (Lavigne et al., 2000).

community as a response to the overwhelmed local governments, as reported by Reuters (2010b):

> Jalin Merapi has helped with shelters that are unable to receive government aid […] the government had established communication systems for volunteers and soldiers but it could not cover all of the 700 refugee centres scattered around the foot of Mount Merapi […] When the community announced they needed help to provide meals for 30,000 people, the meal was ready in four hours.

Additionally, the Jalin Merapi network was able 'to answer a classic question of disaster response; how to connect individuals providing support to individuals who need it' (International Federation of Red Cross and Red Crescent Societies - IFRC, 2015, p. 190). More importantly, the Jalin Merapi network was regarded as a comprehensive example of how a local community can take an important role in disaster response (OCHA, 2013), particularly when the mass media and the local government were unable to effectively function as information sources. How the Jalin Merapi achieved its success during the 2010 Merapi eruption is discussed in detail throughout this thesis. This thesis specifically investigates the conditions for the level of trust it gained and how that trust led to the collective participation of the eruption-affected Merapi residents in generating effective community-based disaster communication. In other words, this thesis offers valuable lessons from the Jalin Merapi network for future disaster response.

1.2. Background of this study

This thesis is a case study of the Jalin Merapi Network and how it was used to fulfill the affected community's demand for trustworthy information coming from their own surroundings and facilitate community-based disaster communication during the 2010 Merapi eruption. In this section, to provide a brief understanding of the case study, I will describe the vulnerability of Indonesia to natural hazards, particularly volcanic hazards, and I will further describe Mt. Merapi in detail. According to The International Association of Vulcanology and Chemistry of the Earth's Interior (National Geographic, 2008) and Surono et al. (2012), Mt. Merapi is worth studying because of its history of frequently destructive eruptions and the proximity of its hazards to a dense human population (National Geographic, 2008, Surono et al., 2012). Therefore, in this subsection, the description of Mt. Merapi will focus on two

different aspects: its vulcanology, and the socio-cultural context of the local community living on its slopes.

1.2.1. Indonesia and natural hazards

Comprising more than 17,000 islands and 254.5 million people on highly unstable tectonic plates (World Bank, 2014), Indonesia is considered to be one of the countries most vulnerable to disaster, with the highest risk of and constant threat of natural hazards in the world (see Figure 1), including volcanoes, earthquakes, tsunamis, floods, and landslides (Dougall et al., 2008, IFRC, 2015). Between 1900 and 2015, Indonesia experienced 464 natural disasters with 241,548 casualties, losses of more than US$ 29 billion and 29,677,381 residents have been affected (EM-DAT, 2016).

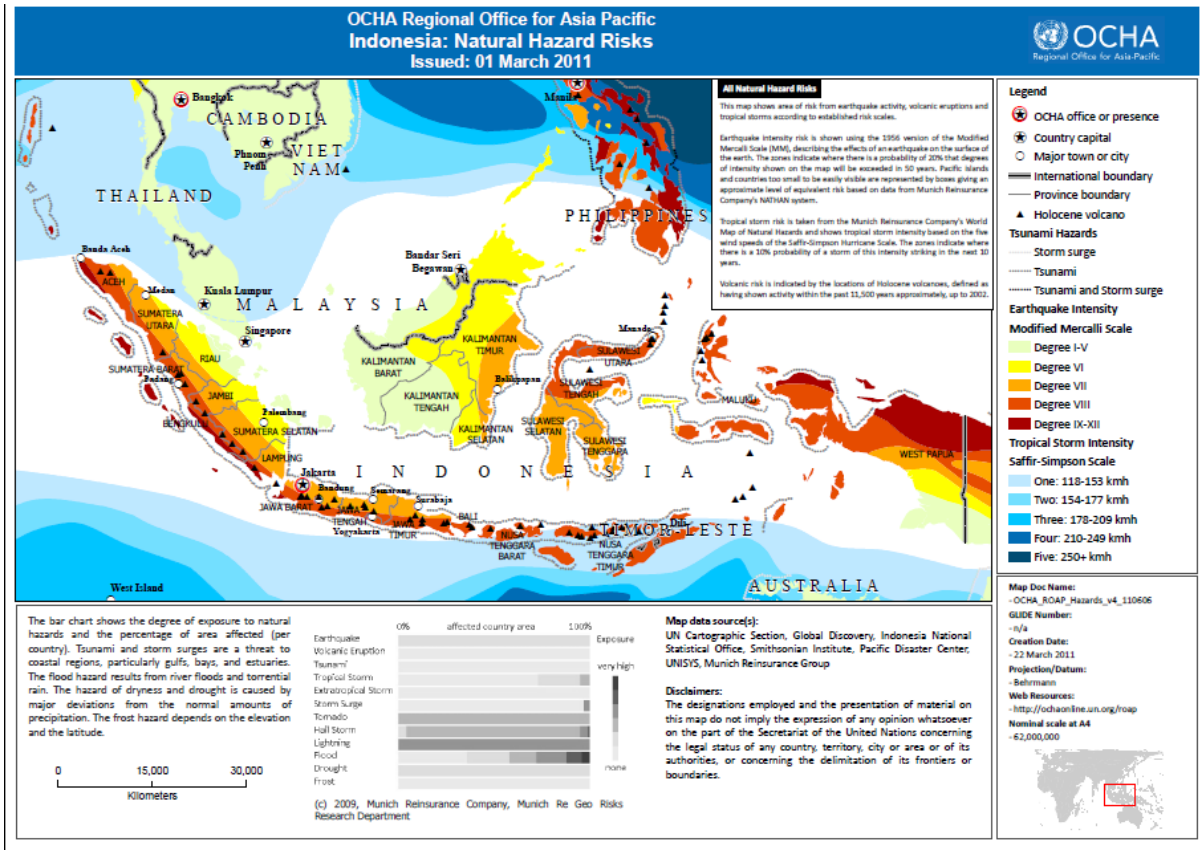


Figure 1. Natural disaster risks of Indonesia (UN OCHA, 2011).

Regarding the risk of volcanic eruptions, the Indonesian archipelago is geographically located in the western part of the Pacific Ring of Fire, the 'hemisphere-girdling string of volcanic mountains' where the world's active volcanoes are concentrated (D'Arcy Wood, 2014, p. 8; Siagian, 2014; Tupper at al., 2004). The volcanic belt of Indonesia consists of 129 active volcanoes in areas of 7,000 kilometres in total length and an average of 200 kilometres

in width (Triyoga, 1991) and the number of active volcanoes in Indonesia represents 13 per cent of active volcanoes in the whole world (PVMBG, 2014). Consequently, Indonesia is the riskiest country for volcanic hazards, because 66 per cent of the global volcanic threat lies in Indonesia; while the second-riskiest volcanic country, the Philippines, has only 10.6 per cent of global volcanic hazards (Brown et al., 2015). In addition to a large number of active volcanoes, there is a dense population living on the lower slopes of the volcanoes (Brown et al., 2015). Specifically, 60 percent of the Indonesian population is centred on 16 active volcanoes, including Mt. Merapi (Voight et al., 2000b). As a result, a volcano eruption often results in loss of life and property (Suryo and Clarke, 1985).

Indonesia has experienced numerous massive volcanic eruptions, including the super-eruption type that occurs approximately every 130,000 years. In fact, three (out of five) of the most explosive volcanic eruptions on earth occurred in Indonesia, namely the eruptions of Mt. Toba, Mt. Tambora, and Mt. Krakatoa; the other two were the eruptions of Mt. Taupo in New Zealand and Mt. Katmai in Alaska (Winchester, 2003). The super-eruption of Mount Toba occured in Toba, Sumatra approximately 75,000 years ago. This eruption formed a volcanic crater 80 km long and 30 km wide and its 3,000 cubic kilometres of volcanic ash may have caused major climatic change for a decade or more (Brown et al., 2015). In more recent history, numerous volcanic eruptions in Indonesia have caused over 130,000 casualties since 1800 (Thouret et al., 2000, Voight et al., 2000), including the two largest eruptions in modern history. The 7 magnitude eruption of Tambora in 1815 is referred to as 'the eruption that changed the world', as it threw 'human communities worldwide into chaos' (D'Arcy Wood, 2014, p. 8), caused 60,000 casualties, and affected global climate and crop growing conditions for three years. The 1883 Krakatoa eruption, referred to as the loudest sound ever recorded in human history, produced over 80 km of pyroclastic flows, the volcanic dust of which changed the appearance of the world's sky and claimed 36,417 casualties (Butt, 2014, Suryo and Clarke, 1985, Brown et al., 2015, Winchester, 2003).

1.2.2. The Mt. Merapi eruptions

The present Mt. Merapi has existed for 2000 years and has erupted frequently ever since (Badan Geologi, 2014)[2]. The frequent eruptions of Mt. Merapi have been characterised by a

[2] The geological history of Mt. Merapi is classified into four periods: (1) the period of *Pra-Merapi* (Pre-Merapi) between 700,000 and 60,000 years ago; (2) the period of *Merapi Tua* (Old Merapi) between 60,000 and 8,000 years ago; (3) the period of *Merapi Muda* (Young Merapi) between 8,000 and 2,000 years ago; and (4) the period of *Merapi Baru* (New Merapi) between 2000 years ago to present (Badan Geologi, 2014).

fluctuating intensity and magnitude, and showed a change of eruptive pattern between the 19th and the 20th-century eruptions. In the 19th century, Mt. Merapi had one or more intense eruptions every 44 – 79 years, but in the 20th century, it has erupted less intensively every 4 – 6 years (Surono et al., 2012; Suryo & Clarke, 1985). It erupts gently (Volcanic Explosivity Index - VEI 1) every 2 – 7 years, explosively (VEI 2) every 8-15 years, catastrophically (VEI 3) every 26-54 years, and cataclysmically (VEI 4) every 150 – 500 years (Badan Geologi, 2014; Schlehe, 1996; Sumarti et al., 2014; Thouret et al., 2000). In the last 2000 years, there have been at least 93 major eruptions (Troll et al., 2015). These occurred in 1675 with approximately 3000 casualties, in 1872 with 200 casualties, in 1930 with 1369 casualties, in 1954 with 64 casualties, in 1976 with 28 casualties, in 1994 with 64 casualties, in 2006 with 2 casualties, and in 2010 with more than 350 casualties (Triyoga, 1991, Troll et al., 2015). In an eruption, Mt. Merapi releases lava, causes earthquakes and a collapsed lava dome, followed by a type of pyroclastic flows (*wedhus gembel* in the Javanese language) consisting of rotating clouds of 200-300 ^{o}C gases that move at a speed of 200-300 km/h, lahars[3], forest fires, landslides and disease epidemics (Triyoga, 1991, Dove, 2008, Surono et al., 2012).

1.2.3. The Javanese community's response to an eruption of Mt. Merapi

Mt. Merapi is located on Java Island (Suryo & Clarke, 1985; Troll et al., 2015), the most densely populated island in Indonesia with 56.9 percent of the total population (Indonesian Statistics Center, 2016) and only 7% of the total land (Troll et al., 2015). The population density on Java Island is 1,109 people per km2; meanwhile, the average population for the whole country is only 132 people per km2 (Indonesian Statistics Center, 2016). Specifically, there are more than 1.1 million people living on the slopes of Mt. Merapi with a population density up to 500 people per km2 (Troll et al., 2015). This large number of people does not only live on the flanks of Mt. Merapi, but as close as five kilometres from the summit (Troll et al., 2015) which is over 2900 m (Suryo and Clarke, 1985, Triyoga, 1991, Troll et al., 2015).

[3] *Lahars* is an Indonesian word for fast-moving volcanic mudflows consisting of volcanic debris and water (Brown et al., 2015).

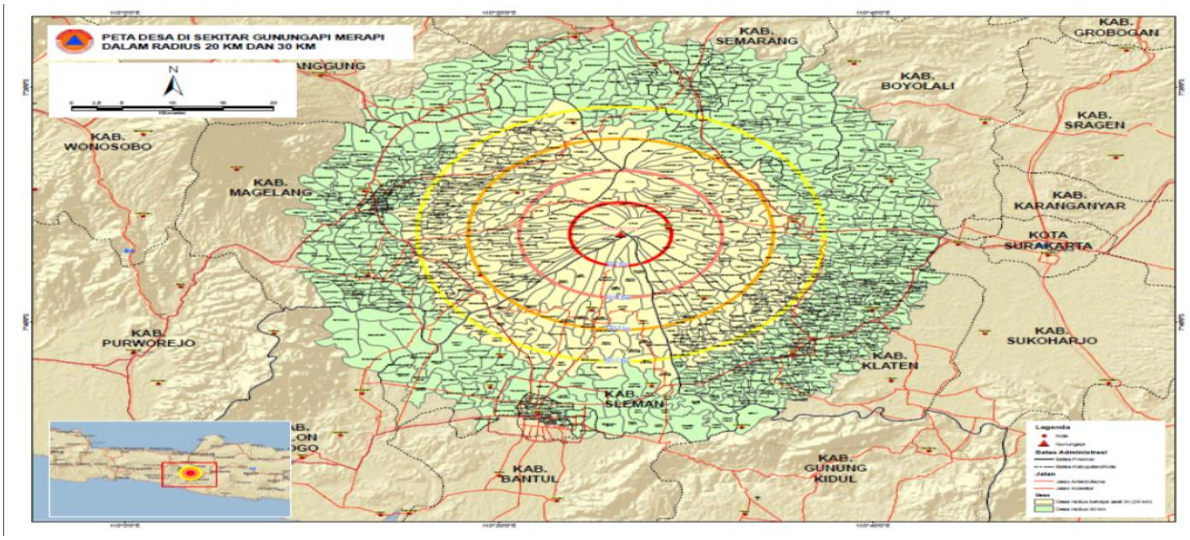


Figure 2. Villages within a radius of 5 km, 10 km, 15 km, and 20 km from the summit of Mt. Merapi (BNPB, 2010).

In addition to the dense population, Mt. Merapi is also well known for the Javanese culture of the villagers who live on its slopes, which strongly influences their behaviours in responding to an eruption[4] (Lavigne et al., 2008, Schlehe, 1996, Schlehe, 2008, Donovan, 2010, Donovan et al., 2012, Dove, 2008, Troll et al., 2015). The Merapi volcano is located in the middle of the Java island of Indonesia and is considered to be the 'heart' of the Javanese cultural environment (Lie, 2012, p. 5). Mt. Merapi's Javanese residents embrace Javanese culture in their daily lives; they speak the Javanese language, practise Javanese traditions and have close kinship structures (BPPTKG, 2014).

For the last 2000 years, the local communities have experienced cycles of the eruptive intensity of Mt. Merapi, which have affected their daily life and influenced their cultural development (Troll et al., 2015). Thus, based on the patterns of the repetitive eruption, the villagers living on the Mt. Merapi slope have developed and inherited an indigenous culture of hazard[5] as well as cultural and psychological relationships with the Merapi volcano to deal with and perceive the risk of volcanic hazards (Donovan, 2010, Sudrajat, 2014, Donovan et al., 2012, Troll et al., 2015, Dove, 2008, Brown et al., 2015). Accordingly, the culture of hazard acts as a creative coping mechanism by domesticating hazards for the community's

[4] Indonesia is regarded as one of the countries with 'an intense cultural relationship with volcanoes and hazards' (Donovan, 2010, p. 118). Some of its active volcanoes (e.g. Mt. Merapi, Mt. Sumbing, Mt. Sindoro, Mt. Dieng, Mt. Sibayak, Mt. Sinabung) have been closely associated with cultural hazard knowledge owned by the local communities living on their slopes (Lavigne et al., 2008).

[5] A culture of hazards often occurs in places where an at-risk community has repetitively experienced a constant disaster caused by natural hazards, and the disaster caused significant casualties and material damage for many generations (Bankoff, 2004, p. 111; Wenger & Weller, 1973, p. 9).

benefits on a day-to-day basis (Bankoff, 2004; Bankoff et al., 2015; Birowo, 2010; Donovan et al., 2012; Dove, 2008; Moore, 1964).

In the culture of hazards, Mt. Merapi has been personified as the respected 'Mbah'[6] Merapi and a sacred kingdom for powerful *baureksa* spirits, which is closely related to the human world and other mystical kingdoms (Triyoga, 1991, Donovan, 2010, Dove, 2008, Troll et al., 2015). The natural processes of an eruption of Mt. Merapi have been personified as the spirit of the Merapi people. An eruption is often regarded as a celebration or a ceremony held in the spirits' kingdom (Schlehe, 1996). The volcanic materials (lahars, ash, and gas cloud) erupted are regarded as the waste from the renovation or cleaning of the Merapi kingdom (Triyoga, 1991, Dove, 2008); the sounds of strong wind and rain, and loud rumblings of thunder are the sound of a party held in the Merapi kingdom or the sound of a group of spirits visiting, or from the kingdom of the South Sea (Triyoga, 1991). The Merapi people have a high sense of perceived safety because of their ancestors' graves and the little mountains surrounding their villages (including the Mt. *Bibi* Merapi – the Aunt of Mt. Merapi). They believe that the spirits of their ancestors will help and protect them from the hazards of Mt. Merapi (Triyoga, 1991, Troll et al., 2015). They also believe that Mt. Merapi would not be brave enough to overstep its aunt and destroy their villages (Triyoga, 1991). In other words, everything in the Mt. Merapi ecosystem is considered to have life and soul.

Each district surrounding Merapi has its local wisdom regarding the livelihood and myths of Merapi. For example, in the southern part of the Merapi volcano, the local communities in the Sleman district annually alleviate the Merapi spirit through an offering ceremony called *Labuhan* (Triyoga, 1991). The *Labuhan* ceremony is usually performed by the spiritual gatekeeper and aims at praying for prosperity, and the safety of the King and the citizens of Yogyakarta from Mt. Merapi hazards (BPPTKG, 2014; Donovan, 2010; Donovan et al., 2012; Lie, 2012; Schlehe, 1996; Troll et al., 2015). In the ceremony, the gatekeeper sacrifices foods, flowers, and incense to the spirit of Mt. Merapi respectfully (Triyoga, 1991) in order to maintain peace and a good relationship with the Mt. Merapi spirit, and persuade them to change the possibility of a future eruption (Troll et al., 2015). In the northern part of the Merapi volcano, the Selo communities also have a similar cultural ceremony called *Sesaji Alam* (natural offerings) to the Merapi volcano. The ceremony is aimed at expressing

[6] "Mbah" is an appellation for elders in the Javanese language.

gratitude for the fertile soil and praying for the security of their livelihoods from Merapi hazards.

In addition to the cultural myth of the Merapi kindom and the cultural ceremony, the existence of a spiritual gatekeeper of Mt. Merapi has been an inseparable part of the culture of hazard owned by the local communities living in the Mt. Merapi surroundings. For example, many people in the Sleman district believe that the spiritual gatekeeper[7] of Mt. Merapi knows everything about it and can lead them in critical times (Combine, 2007, Triyoga, 1991), because of his ability to communicate with Mbah Merapi and its spiritual army (Triyoga, 1991). Thus, some community members living on Mt. Merapi's slopes tend to trust the gatekeeper rather than the local governments in matters to do with Mt. Merapi, particularly regarding evacuation decisions (Donovan, 2010, Troll et al., 2015). The gatekeeper also has the authority in deciding whether someone may climb Mt. Merapi or not, and acts as a skipper in a missing-person rescue (Triyoga, 1991). Moreover, apart from the formal leadership, the gatekeeper is an honoured cultural leader at the community level. Many people come to him for his blessings, his advice on a wedding date or for a name for a new-born baby, etc.

As the result of the cultural geo-mythologies, the local communities living on the slopes of Mt. Merapi have been well-known as risk-taking societies when it comes to an eruption of Mt. Merapi. The cultural belief in the supernatural has become the community's framework for familiarizing, adapting, and domesticating volcanic hazards in everyday practices (Dove, 2008), and providing a 'sense of subjective security' in facing uncertainty during an eruption (Triyoga, 1991; Troll et al., 2015, p. 161). Moreover, unlike the outsiders who perceive Mt. Merapi's eruption as a hazardous event that should be feared, the local communities regard the hazards of Mt. Merapi as not destructive, but blessed catalysts for the economic benefit of their lives (Triyoga, 1991, Troll et al., 2015, Dove, 2008, Donovan et al., 2012, Lavigne et al., 2008). The local communities believe that they are part of the Mt. Merapi macrosystem. Thus, they have to act respectfully and behave in harmony with their peers, Mt. Merapi, and the spirit of the Merapi kingdom. By doing so, they believe that they help the Merapi kingdom to balance the cosmos and they will achieve fertility, safety, and a prosperous life in return (Triyoga, 1991).

[7] The spiritual gatekeeper *(juru kunci)* of Mt. Merapi is designated by the Sultan (the King of Ngayogyakarta Kingdom) who is also the Governor of the Province of Yogyakarta.

In addition to the influences of the cultural beliefs, the worry about daily livelihoods and livestock are the other socio-culture aspects of the Merapi people that increase their reluctance to evacuate during an eruption (Donovan, 2010). Specifically, livestock is regarded as an indispensable part of their livelihood, the main sources of income and part of their families[8] (Bachtiar, 2014). Similarly to the previous Merapi eruptions, most community members hesitated to evacuate because they did not want to leave their livestock as they might starve or be stolen in the 2010 Merapi eruption. If they did decide to evacuate, there was a high level of stress among the refugees because they were worried about their livestock. This is clearly described by one of the volunteers from the Jalin Merapi network:

> The communities were reluctant to evacuate…they worried about their livestock. If they evacuated, who would feed their livestock? This is related to their cultural behaviour. For the Merapi people, the livestock are their livelihood…When Merapi erupted, they had to evacuate and leave their livestock. They were extremely anxious (Dewi, personal interview, 26 March 2014).

In the 2010 Merapi eruption, similarly to the previous eruptions, it was challenging to keep the evacuees from returning home every time Mt. Merapi showed slightly decreasing volcanic activity. The volcanic hazards were still threatening despite the decrease in activity showed by Mt. Merapi at times. Many of the evacuees insisted on coming home or doing a part-time evacuation (returning to their homes during the day and staying at the IDP camps at night) to take care of their livestock (Lavigne et al., 2008, Donovan, 2010, Troll et al., 2015). To prevent people from doing so, the national government guaranteed to give five to ten million Indonesia Rupiah (approximately $523 to $1047 NZD) for each head of the cattle owned by the Merapi people (Kompas, 2010). Yet, the offer would only partly meet the concerns of the affected community, as the livestock was more than just financial assets for them.

1.3. Research gaps in the existing research on disaster communication

Taking the strong influences of the socio-cultural factors into account, the disaster communication in responding to the Merapi eruption must be understood as a complex communication process. Disaster communication is more than a function of informational messages. It can not be easily defined as communicating information about physical and

[8] The behavior of returning home from evacuation to take care of livestock and crops also occurs in other countries, such as the Philippines, Ecuador, and Tonga (Brown et al., 2015).

economic safety. Instead, how disaster information is shared and understood in different ways by different audiences, and how different audiences perceive and address hazards differently cannot be separated out in disaster communication. Thus, in order to understand this, it is important to involve community's perspective in disaster communication. Reinforcing the importance of the community's roles at the global level, the United Nations has released the Sendai Framework calling for special attention to community engagement and community participation in and a people-centred approach to an effective disaster management, developed in the Third World Conference on Disaster Risk Reduction held in Sendai, Japan. The people-centered approach is sometimes focused on as a matter of communication, as described below:

> To invest in, develop, maintain and strengthen people-centered multi-hazard, multisectoral forecasting and early warning systems, disaster risk and emergency communications mechanisms, social technologies and hazard-monitoring telecommunications systems; develop such systems through a participatory process; tailor them to the needs of users, including social and cultural requirements, in particular gender; promote the application of simple and low-cost early warning equipment and facilities; and broaden release channels for natural disaster early warning information (United Nations, 2015, p. 21).

Similarly, in the World Disaster Report 2015, the International Federation of the Red Cross and Red Crescent Society (IFRC) also emphasised the focus on communication with and participation of local actors as the key criteria for efficient and accountable humanitarian responses, because:

> Their effectiveness goes beyond their proximity. They are also effective because of the perspective they bring. Because they are present in communities before a crisis hits, they see it not as an event in and of itself, but as something that is linked to the past, to unaddressed risks, vulnerabilities and inequalities (IFRC, 2015, p. 8).

The concept of local is contextual, that is, depending on an individual's point of view. For example, from the international perspective, the locals can be conceptualized as those, including the community and the government, at the national level; from the national perspective, the locals can be conceptualized as those at the regional level. In this thesis, the locals are defined as the members of an affected community who personally experience a natural hazard.

Global awareness of community roles in disaster communication has been implemented recently in a growing number of 'local volunteer tech communities'; these have been activated in the 2012 Hurricane Sandy and the 2015 Nepal earthquake, where user-generated information was collected from local community networks and satellite imagery by utilizing social media, OpenStreetMap, or the Ushahidi platform (IFRC, 2015, p. 184-186). While the local volunteer tech communities have shown great success in working with local communities using novel communication technologies, those efforts have focused on collecting the insiders' information for the use of the outsiders in order to help the affected community effectively. However, they still overlook the affected community's own need for trustworthy disaster information. It is important to fulfil this particular need as the affected community suffers most from a disaster.

Similarly to the way the local volunteer tech communities have overlooked the needs of affected communities themselves for trustworthy disaster information in recent disasters, I identify a lack of attention in the current studies to the perspective of the affected community as the information receivers in disaster communication. This is particularly the case in regard to how disaster communication is regarded as trustworthy by the affected community, and the community's offline characteristics than can facilitate collective participation. Most studies of disaster communication have failed to recognize the way information receivers, in particular the affected community, regard trustworthiness based on their perspectives of historical, ethnic, and cultural values on how they understand a hazard (Steelman et al., 2015, Reinhardt, 2015, Ferrante, 2010, de Certau, 1998, cited in Kitley, 2001, Harvard Humanitarian Initiative, 2011). Instead, disaster response including disaster communication generally focuses on the efforts to rescue the victims, minimize the damage and provide the physical essentials, as acknowledged by Bankoff (2004, p. 110):

> There is still a tendency to underestimate the extent to which disasters are also perceptual phenomena, occurrences that take place and shape in people's minds. The focus on people's physical, social, economic and political vulnerabilities and their comparable capacities or coping practices obscure just how much these are likewise cerebral events that influence behavior.

Moreover, studies of disaster communication often focus on designing messages and selecting media to ensure the intended disaster information is well-received by the affected community (Reynolds and Seeger, 2005, Steelman and McCaffrey, 2013, Witte and Allen, 2000). Yet, focusing on message design and media usage does not always guarantee trust

encouragement (Steelman et al., 2015). In other words, even if an information source/channel becomes the most used means of disaster communication, it may not necessarily be regarded as equally useful or trustworthy by its audiences, and vice-versa.

Moreover, numerous scholars have shifted their focus on participatory disaster communication to internet-based media, particularly social media, as the new means to promote community participation in disaster response. The shifting focus is understandable as online communication technologies can enable timely, unfiltered, and interactive backchannel disaster communication by expanding new forms of peer-to-peer information-seeking and information-providing behaviour (Doan et al., 2012, Dufty, 2012, Gao et al., 2011, Lindsay, 2011, Palen, 2008, Taylor et al., 2012, BBC, 2012, Nugroho, 2011, OCHA, 2013, Potts et al., 2011, Fearn-Banks, 2011). However, engaging social media does not automatically provide trustworthy and accurate disaster communication, even though it may simplify the participation mechanism for community members. Online participatory disaster communication may be compromised by a combination of overloaded information, myriad information sources, and a lack of aggregation and validation mechanisms (Gao et al., 2011, Austin et al., 2012, Crowe, 2012, Harvard Humanitarian Initiative, 2011). Consequently, in order to be considered for official response efforts, social media creates other demands for continual organizing, monitoring of credibility, and additional verification mechanisms to establish reliable disaster communication for publicly-concerned decision making (Palen et al., 2010, Palen and Liu, 2007, IFRC, 2015). These demands reinforce the importance of understanding what the local audience, the affected community in this case, regards as the trustworthiness of disaster communication.

The recent focus on the usage of online media for community participation seems to overlook the other traditional means of communication, which still exist and are still used by local communities. This thesis addresses this gap in the research regarding media usage in community-based disaster communication. The practices of disaster communication seem to assume that, in order to have a better response, a community simply needs to own and advance the novelty of current communication technologies. However, using novel communication technology does not always guarantee the trustworthiness of disaster communication. Communication technologies are simply the tools that can expand the existing capacity of a community to 'respond, communicate, and organise collectively' in order to fulfil their local needs (IFRC, 2015, pp. 186, 201). This means that pre-existing communication technologies are still useful for facilitating a successful disaster

communication. The IFRC (2015, pp. 194-195) identified that technology usage in a disaster communication is more likely to be successful when 'the volunteers are familiar with the technology' and the technology 'directly supports an existing activity'. However, how a disaster-affected community participates in disaster communication through a combination of traditional ('leave-behind') media and new media is still under-explored.

Moreover, disaster management practice, including disaster communication, has been very much dominated by the Western scientific paradigm (IFRC, 2015). The approach may generate useful lessons for those countries with a high level of scientific awareness, but it is by no means clear that it will be equally applicable to developing countries with varying levels of scientific awareness and culturally affected communication behaviours that are often unaligned with the 'assumption of avoidance-loss so much favoured by Western social science' (Bankoff et al., 2015, p. 9). The community perspective in developing countries, particularly, has been less explored and less documented in existing studies of disaster communication; meanwhile, the levels of vulnerability and risk of many developing countries often 'greatly exceed their capacity to respond to disaster' (Nottage et al., 2014, United Nations, 2015, p. 24).

In summary, the thesis addresses three gaps in existing research on disaster communication: how disaster communication is regarded as trustworthy by the affected community, the community's offline characteristics that can encourage collective participation, and the combination usage of traditional media and new media in disaster communication. The thesis focuses on trustworthy and participatory community-based disaster communication in disaster response by specifically investigating the case study of the Jalin Merapi network during the 2010 Merapi eruption in Indonesia. In responding to the debate on whether community-based disaster communication is trustworthy, the objective of this research is to investigate the roles of an affected community in encouraging trustworthiness and collective participation based on their knowledge, experiences, and vulnerabilities. This thesis has not necessarily sought evidence to support verified or accurate community-based disaster communication, but rather investigates the social capital of the affected community that can establish perceived trust and community participation in community-based disaster communication. Further, this thesis also expands the focus on community-based disaster communication to examine how an affected community participates in providing, verifying, and sharing disaster information in a trustworthy community network based on their own knowledge, experiences and vulnerabilities.

Therefore, it is argued that disaster management needs to start moving from a supply-driven approach based on the priorities of outsiders to a demand-driven approach based on the priorities of the affected community. Placing the efforts of disaster response on the existing capacity and participation of the targeted community is an effective way to ensure effectiveness and simultaneously reduce community vulnerability (IFRC, 2015, Troll et al., 2015). Hence, disaster communication needs to build and frame a new perspective on citizen-based activities, which arise out of peer-to-peer communication in a disaster context, that serve important tactical, community capacity building and emotional functions (Palen and Liu, 2007, Sutton et al., 2008, Crowe, 2011, Bankoff et al., 2015). Again, community-based disaster communication enables the affected community to promote local voices and serve local interests by participating in information sharing.

1.4. Research questions

As the thesis focuses on trustworthiness and participatory community-based disaster communication in a disaster response, it is expected to answer the following research questions:

RQ1. What do the members of the affected community regard as trustworthy and community-engaging official disaster communication in responding to the Mt. Merapi eruption?

RQ2. How can community-based disaster communication be regarded as trustworthy and facilitate community participation in disaster response?

> RQ2.1. How can a culture-embedded communication encourage trust and collective participation in community-based disaster communication?
>
> RQ2.2. How can the tie strength of local networks encourage trust and collective participation in community-based disaster communication?

RQ3. How does the affected community participate in community-based disaster communication through media multiplexity?

Based on the research questions, the arguments are expected to be able to turn the gap between a community-based informal approach and an organisational formal approach in

disaster management into an integrated information network that can fulfil the information needs of affected communities as the first responders. Again, since the area of trustworthy and participatory community-based disaster communication in developing countries is still under-explored, the thesis is expected to enrich the literature of disaster communication and disaster management.

1.5. Thesis outline

This thesis consists of seven chapters. This chapter has described the event of the 2010 Merapi eruption, the Jalin Merapi community-based network, and the socio-cultural context of the local communities living in the area around Mt. Merapi surrounding as the background of the thesis. It identified the significant need for trustworthy community-based disaster communication during a disaster response, especially when both the mass media and the local government lose their credibility as trustworthy and reliable information sources for local communities. This chapter also notes the gaps in existing research on disaster communication regarding trustworthy and participatory disaster communication from the perspective of the affected community. By selecting the case study of the Jalin Merapi network, the thesis addresses these gaps by investigating what is regarded as trustworthy in the Jalin Merapi network by the affected community and how this community participated in the network during the 2010 Merapi eruption. As this chapter identifies, the objective of the thesis is to investigate the social capital of an affected community in encouraging trustworthiness and facilitating collective participation in community-based disaster communication.

Chapter Two reviews the multi-disciplinary literature of disaster management, disaster communication, community capacity, and community radio stations that is used as a theoretical framework in this thesis. The research gaps identified in Chapter One are also discussed further in the chapter. Specifically, Chapter Two reviews the theoretical relationships between institutional logic in official disaster management, and trust and effectiveness; between culture and trust; between the tie strength of the social network, trust, and information sharing; between media multiplexity and community participation; and between community radio stations and community participation in natural disasters. A multi-disciplinary theoretical framework is used to develop an understanding of trustworthy and participatory disaster communication and, simultaneously, to define the research scope of the thesis.

Chapter Three establishes the methodological framework adopted in the study in order to construct an integrated and comprehensive theoretical understanding of trustworthy and participatory community-based disaster communication. It explains the constructivist and interpretative paradigms as the epistemological and ontological foundations of this study, which also become the grounding logic for the selection of the qualitative methodology in this study. The chapter also details the selections of constructivist grounded theory and the qualitative case study of the Jalin Merapi network in the 2010 Merapi eruption adopted in this study. The discussion is followed by descriptions of the theoretical sampling used in determining the research participants, and the research methods of in-depth interviews and focus groups used to gather data in this study. Further, the chapter outlines the ethical procedures followed to gain access to the research participants, protect the rights of the research participants, and meet the Indonesian administrative requirements for conducting this study. The chapter ends with an explanation of the methodological steps of the data analysis in the grounded theory applied in constructing a theoretical framework describing the patterns and relationships between the concepts of trustworthy and participatory community-based disaster communication in the study.

Chapter Four acknowledges the absence of the perspective of an affected community regarding what the community members regard as trustworthy and community-engaging official disaster communication in practice. The chapter analytically addresses the first research questions by identifying that the local community's distrust of official disaster communication is based in a perception that official information is delayed and inaccessible, that officials and communities have different perceptions of risk, and official information channels have no scope for community engagement. The chapter explains the reciprocal lack of trust in the relationship between the authorities and the local community living in the area surrounding Mt. Merapi, which is strongly influenced by the communication behaviours of each party. Further, the chapter contrasts the community's perception of official disaster communication with the local governments' perception that community-based disaster communication is untrustworthy, based on their institutional and scientific logic and their perception that the affected community has an elevated perception of risk. This is followed by a discussion of community engagement that can be a bridge for the reciprocal trust between the authorities and the affected community.

As a response to the officials' lack of trust in community-generated disaster information detailed in Chapter Four, Chapter Five explains the way community-based disaster communication can be trustworthy and participatory, which addresses the second research question of this study. The chapter sets out the role of community radio stations as facilitators of trustworthy and participatory community-based disaster communication. The chapter discusses the social capital embedded in the involvement of the volunteers in the community radio stations. Being representative of the social capital owned by the Merapi people, the volunteers successfully encouraged trust and collective participation in the Jalin Merapi network during the 2010 Merapi eruption. In particular, the chapter details the way culture-embedded disaster communication can encourage trust. It also details the positive role of the tie strength embedded in the personal social network owned by the community radio volunteers as members of the affected community, information sharing, and trust in disaster communication. The chapter will further discuss how the internal participatory mechanisms of the community radio system encourage a sense of community among their surrounding community members and lead to collective participation in Jalin Merapi.

During the 2010 eruption, the Jalin Merapi network was recognised for the way it encouraged participation by the affected community, which enabled it to share disaster information from the affected community to the people outside the affected areas and vice-versa. Thus, Chapter Six addresses the third research question of this study by explaining the way the affected community participated in providing and sharing local information through the media multiplexity of Jalin Merapi. The chapter explores the integrated platform of media multiplexity used by the Jalin Merapi network, with the participation of the affected community, for providing and sharing information. In particular, the chapter details the use of media that are already commonly used in existing local disaster communication around Mt. Merapi, in order to make it easier for local people to participate in community-based disaster communication through the Jalin Merapi network. The chapter also details the engagement of the existing local social network of the affected community for facilitating information provided by isolated affected community members and extending the exposure of information sharing within the affected community.

Still addressing the third research question, Chapter Seven specifically explains the process of community participation in verifying disaster information. It details Jalin Merapi's community-based verification mechanisms for ensuring the validity of the information provided by the affected community, by engaging voluntary participation of the other

affected community members, including the community radio volunteers, to verify the information on the ground. The chapter also details the way Jalin Merapi attempted to keep up with the fast-pace of information changes during the disaster response by publishing information about the needs of the evacuees without prior verification and verifying the information about the actual eruption before being published. However, community-based verification mechanisms were strongly rejected by the local governments, which heavily relied on an institutional logic of accountability. To give a clear explanation of the rejection, the chapter contrasts the community-based verification mechanisms with the official verification mechanisms in disaster communication. Further, focusing on the affected community as the most disadvantaged party in disaster response, this chapter discusses the compatibility of Jalin Merapi's community-based verification mechanisms with individuals' perspectives on verified and trustworthy disaster communication. Finally, Chapter Eight summarises the key arguments discussed in the previous chapters with reference to the research questions. The chapter also identifies the theoretical and practical contributions of the thesis, and provides suggestions for future study in order to gain a broader understanding of trustworthy and participatory community-based disaster communication.

Chapter 2

Theoretical framework

A central part of the 2010 Merapi eruption was the failure of the authorities to communicate effectively with the affected community. In order to understand this problem, it is not enough to understand what information was right or wrong, but what made the disaster communication inadequate. A key element in that is trust. The availability of trust can facilitate rapid decision-making during critical times and establish effective collective efficacy (Murayama et al., 2013, Reinhardt, 2015, Waugh and Sylves, 2002). Specifically, trust affects the overall quality of the communication process by increasing the efficiency of information seeking, and the resulting community participation based on information shared (Granovetter, 1973, Jaeger et al., 2007, Johnson, 2007, Tang et al., 2012, Uslaner, 2002). Aiming at achieving the positive effect of trust, some scholars emphasise the information source as a significant determinant of encouraging trust in disaster communication (Covello et al., 2001, Sandman, 1993, Fisher, 2013, Jaeger et al., 2007). They specifically identify that people are unlikely to pay attention and act on information provided by someone in whom they have a lack of trust, no matter how crucial the information is. Information from that source will be regarded as less trustworthy, less useful and thus ineffective, preventing the transformation of the information provided into usable knowledge. In other words, identifying the information sources that are considered to be trustworthy could be more important than identifying a specific medium for whether the information is considered trustworthy by the affected community. If a particular information source is regarded as trustworthy, it would be consistently regarded as trustworthy no matter what medium the information is being shared through. Conversely, if an information source is regarded as untrustworthy, its information would not suddenly be regarded as trustworthy when it is shared through a particular medium. Therefore, this chapter focuses on how a specific information source can encourage trust in disaster communication, particularly for the authorities and an affected community.

Not only in this chapter, trust is such an important term throughout this thesis. The definition of trust here is closely related to confidence in the reliability of a person or a system, and an emotional feeling of 'ontological security' (Giddens, 1990, p. 92). In defining the terminology of trust, I adopt the definition of Giddens. He defines trust as:

> [C]onfidence in the reliability of a person or system, regarding a given set of outcomes or events, where that confidence expresses a faith in the probity or love of another, or in the correctness of abstract principles (technical knowledge) (1990, p. 34).

The review of multi-disciplinary literature in the chapter is focused on the relationship between officials and the public in disaster communication, trustworthy and participatory community-based disaster communication, and community radio stations. In particular, I will begin the chapter by reviewing the literature of official disaster communication, particularly in regard to its institutional logic and its association with trustworthiness and effectiveness. Then, I will review the literature related to how a community's social capital (as the offline driving factors) can encourage trust and facilitate collective participation in community-based disaster communication without depending on a particular medium. Particular attention will be paid to the significance of the culture-embedded disaster communication and tie strength of the local social network. Further, I will review the literature on community participation and media multiplexity. As the study focuses on the community radio stations as the local actors of trustworthy and participatory community-based disaster communication, I will review the literature on the cultural characteristics of radio broadcasting and participatory mechanisms of radio management accordingly.

It is important to emphasise that this chapter aims at using the literature to define the object of study and the relevant issues, but not to pre-theorise it. The literature review is useful for identifying how trust and community participation are usually maintained and the role they usually play. Further, the literature review aims at informing the analytical process to understand trustworthy and participatory community-based disaster communication, not necessarily to drive the construction of the understanding. The understanding of trustworthy and participatory community-based disaster communication is particularly built on a collaborative understanding between the research participants and myself as the researcher by adopting the constructivist grounded theory. The research methodology of constructivist grounded theoretical methodology will be discussed in the next chapter thoroughly.

2.1. Trust and official disaster communication

As a formal institution, the behaviours of a government agency, including disaster communication, are often solely based on institutional logics of the way an agency identifies, values, and sets itself as an organisation (Lammers, 2011, Thornton and Ocasio, 2008).

According to Friedland and Alford (1991) and Lowrey (2009, p. 48), institutional logics have been centralised on the symbolic and unquestioned power of organisational structure, habits, and norms in decision-making, and the 'fruitfulness of loose coupling'. Further, they describe that the logics have constituted how an organisation is supposed to perform its practices in connection with other institutions and which resources are available to elaborate. The logics also have simultaneously constrained institutional practices technically and materially.

The practice of official disaster communication based on the institutional logic often creates a great gap between the authorities and the public, and has been contested frequently by the affected community who demand 'creative responses' (Bankoff et al., 2015, p. 6). According to Lowrey (2009, p. 45), organisational practices, including official disaster communication, aim to:

> [S]eek public legitimacy through conformity with wider cultural "accounts" of how an organisation or field is supposed to behave and which accord with the needs of other social, political, and economic institutions.

The aim may become independent from organisations' functionalities and frequently buffer organisations from 'the demands of external realities'. Similarly, Bankoff et al. (2015, p. 14) identify that:

> Many DRR (Disaster Risk Reduction) organisations or policies are sometimes divorced from the reality…DRR staff and institutions are often aware of the gaps between their own goals and those of the people they are claiming to help. But they are often not willing to accept that this is a problem, or find it difficult to challenge the institutions' remit to take it into account.

The authorities treat their formal structure of official disaster communication as a legitimacy that must be taken for granted by the public. As a result, they often overlook people's rights of inspection and control over their techniques and outputs of official disaster communication (Lowrey, 2009, Meyer and Rowan, 1977). In other words, the affected community's perception of the effectiveness and trustworthiness of official disaster communication is often neglected by the authorities in determining the success of official disaster communication. The authorities have solely evaluated their practice of official disaster communication based on institutional logic and not based on whether the practice has been able to fulfill the demands of the affected community during a disaster response. The lack of acknowledgement of the perspective of an affected community leads the first question of this study regarding

what the community members regard as trustworthy and participatory official disaster communication in practice. The community perspective needs to be addressed in order to identify the historical gap between the authorities and the affected community, and make the community feel more engaged in official disaster communication. More importantly, trust between local communities and authorities is particularly essential for a successful official disaster communication (Tang et al., 2012, Widén-Wulff et al., 2008).

Yet, some scholars have identified a lack of trust in official disaster communication (Lavigne et al., 2008, Slovic, 1987, Slovic, 1993, Sandman, 1993, Chatfield et al., 2014). This has been mainly encouraged by a lack of an interactive exchange of information, a lack of community engagement using a collaborative mechanism in official disaster communication, and the bureaucratic hindrances in government systems of disaster management (Chatfield et al., 2014, Harvard Humanitarian Initiative, 2011, Jaeger et al., 2007, Samadhi, 2014). *Firstly*, many government institutions still use a one-way and top-down approach in conducting their official disaster communication. Yet, despite being the conventional basis for official disaster communication, the unidirectional top-down model of information dissemination has increasingly failed to fulfil the growing demand for interactive communication (Palen, 2008, Reynolds and Seeger, 2005, Jaeger et al., 2007, Steelman et al., 2015). As a result, there has been a scarcity of refugee-originated official information because refugees have faced difficulty in communicating 'what they consider significant' to the authorities (Sandman, 1993, p. 586). OCHA (2013, p. 25) even identified that lack of two-way communication is a 'common and glaring deficiency' and 'a persistent problem that has been observed in many natural disasters'.

Nonetheless, the unidirectional top-down communication model does not necessarily guarantee accessibility to official disaster information by the affected community. Some official disaster information remains quarantined and disaster affected communities often have difficulty in accessing the information; survivors become frustrated due to a lack of relevant information (Kanayama, 2012). Particularly in Indonesia, Tanesia (2007) evaluates that the official disaster communication is mostly dedicated to delivering official information[9] to general audiences through mass media; there has been no sustainable information framework that is specifically dedicated to delivering official information to the vulnerable people in disaster zones. Meanwhile, in addition to the reliance on established

[9] The terminology of 'official information' here is referring to the disaster-related information that is officially released by the authorities.

expertise, Giddens (1990) identifies that trust (and lack of trust) in an abstract system, such as official disaster communication, is also influenced by individuals' experiences of receiving updated information through various communication media from the authorities.

Secondly, the lack of interactivity in official disaster communication shows a lack of priority on the critical value of the feedback of information receivers, including the affected community. The governments often see community members simply as targets to be reached rather than as citizens to be consulted and involved on a continuing basis (Bakir and Barlow, 2007, Palen, 2008). Consequently, authorities have rarely engaged the affected community in a collaborative mechanism in official disaster communication. For example, in 2014, IFRC and UNDP identified that only 13 out of 31 studied countries had a government policy that regulated local civilian participation in disasters. Yet, the existence of policies for community participation does not guarantee a smooth implementation because there may be a lack of clear procedures, or the policies may not embrace all aspects of a civil society such as indigenous practices (IFRC, 2015). Subsequently, the lack of interactivity and the lack of community engagement are most likely to make official disaster communication less useful and trustworthy (Steelman et al., 2015, Tang et al., 2012). In a similar fashion, Giddens (1990) agrees that simply connecting lay public and experts is not enough to encourage trust between them; they need to be regularly bound up with each other to establish friendship to be taken for trustworthiness.

Thirdly, in regard to the bureaucratic hindrances in government systems, Chertoff (2005), Samadhi (2014), and Murayama et al. (2013) identify that different administrative levels of government often result in a culture of bureaucratic silos and sectoral ego. Specifically, in Indonesia, both the Indonesian central government and the regional governments share very similar authorities and responsibilities in disaster management (Butt, 2014). This jurisdictional overlap can lead to an institutional paralysis because policies over the same issue may differ. Furthermore, bureaucratic silos, sectoral egos, and jurisdictional overlapping often result in unnecessarily layered and repetitive coordination, and an inability to connect multiple emergency plans. The authorities may face difficulties in producing rapid decision-making, regardless of the need for a timely response. Samadhi (2014, p. 178) has identified that the 'core strategic threat' to the trustworthiness of the Indonesian official disaster management is the public's perception of internal corruption in government agencies (Donovan et al., 2012).

Effective dissemination of official disaster information can be a vital form of assistance for affected communities to reduce uncertainty and panic, and be a reference for effective aid based on the affected communities' real needs (BBC, 2012, WHO, 2001). However, the lack of interactivity, the lack of community engagement, and the bureaucratic hindrances of official disaster communication can create a communication gap between a community and the authorities, which prevents the effectiveness of information exchange accordingly. As a solution to the gap, Donovan (2010), Fraser and Estrada (2001), Lavigne et al. (2008), Moody (2013), Murayama et al. (2013), Sandman (1993), and United Nations (2015) suggest that the authorities need to engage the voices of the disaster-affected community members in their policies. Particularly in official disaster communication conducted by the authorities who are mostly the outsiders, Bankoff et al. (2015) affirm that it is important to engage local actors to reduce the likelihood of failure in disaster communication.

Engaging citizen-centric disaster communication can provide immediate benefits both for the authorities and the affected community. On the side of the authorities, they can have a better understanding of what is happening at the grassroots level, so they can effectively respond to the real needs of the affected community in a way that the community accepts and complies with. On the other side, the affected community can 'understand government risk perception more clearly, so that they can take appropriate actions' in responding to a disaster (Chatfield et al., 2014, 160), and provide support to the authorities based on their knowledge, experiences, and resources (United Nations, 2015). More importantly, community participation can generate a sense of accountability for disaster response efforts, including those performed by all levels of government (Chatfield et al., 2014, Jaeger et al., 2007, Samadhi, 2014, Sandman, 1993, IFRC, 2015), which may further lead to trustworthiness (Harvard Humanitarian Initiative, 2011; Steelman et al., 2015; Tang et al., 2012).

2.2. Trust and community-based disaster communication

Particularly in community-based disaster communication, disaster information emerges from individual resources; thus, trust is highly demanded by the information receivers when the personal information is raised into a collective attention (Widén-Wulff et al., 2008). Referring to Giddens (1990), again, trust between community members is different from trust in the authorities that relies on an expertise system. Giddens specifically describes that trust between individuals relies on the personal relationships between them:

> There is that established between individuals who are well known to each other and who, on the basis long-term acquaintance, have substantiated the credentials which render each reliable in the eyes of other. Trustworthiness in respect of the disembedding mechanisms is different, although reliability is still central and credentials are certainly involved (p. 83).

Yet, the trustworthiness and the reliability of community-generated disaster communication are still contentious. Austin et al. (2012), Gao et al. (2011), and Harvard Humanitarian Initiative (2011) argue that community-generated information draws attention to the absence of a mechanism to aggregate and validate the information. Supported by the practicality of communication technologies, it is becoming easier to spread false or manipulated information for individuals (IFRC, 2015). On the other hand, Uslaner (1999) and Veszteg et al. (2015) argue that cooperative behaviours and mutual trust in interpersonal relationships increase in a disaster response, as individuals are more likely to expect reciprocity from a person than from an entity such as the government. The trustworthiness of community-based information and the cooperative actions of a community rely heavily on and simultaneously result from the social capital embedded in the social relationships and active interaction among individuals (Harvard Humanitarian Initiative, 2011, Jaeger et al., 2007, Putnam, 2000, Tang et al., 2012). Similarly, Alder and Kwon (2001), and Fukuyama (1995) agree that social capital is an investment for trust establishment, and a level of trust may represent the level of social capital embedded within a social network.

Specifically, Cohen et al. (2007) and Steelman et al. (2015) identify that community-based information is trustworthy because community members can take into account local concerns when providing locally-relevant information. Moreover, Palen et al. (2007), Putnam (1995), Rojas et al. (2011), and Stephenson (2005) add that the features of a community's social networks, both formal and informal, have a positive association with effectiveness, trust establishment, voluntary participation and collaboration among group members in a collective action. Following studies that support the trustworthiness of community-based information, this section will further elaborate on the literature of culture-embedded communication, as an attempt to provide locally-relevant information (as a cognitive dimension of social capital)[10], and its association with trust encouragement and community participation. Also, the literature of tie strength, as one of the features of the social network

[10] Hazleton and Kennan (2000), Nahapiet and Ghoshal (1998), Tang et al. (2012), and Tsai and Ghoshal (1998) classify shared knowledge as a cognitive dimension of social capital, and a pattern of a social network as a structural dimension of social capital.

(as a structural dimension of social capital) of the affected community, will be considered along with its association with trust encouragement and community participation. Again, the literature of social capital, culture-embedded communication, and tie strength is used to identify the existing relationships between each of them and trust. Yet, the understanding of the relationships in this thesis is not merely based on pre-theorising the literature, but is driven beyond the limits of existing theories without abandoning those theories.

2.2.1. Culture, trustworthiness, and collective participation

In many cases of natural disasters, traditional cultural beliefs have been proven to have significant impacts, both positive and negative, on the vulnerability and disaster behaviours of an affected community (Troll et al., 2015). The indigenous culture of a community that has repeatedly experienced disaster events, can be useful in providing effective disaster mitigation, effective disaster response, and strengthening community resilience based on what are culturally acceptable and past experiences (Bankoff et al., 2015, Chandra et al., 2006, Donovan, 2010, Donovan et al., 2012, Ghodse and Galea, 2006, Troll et al., 2015). On the other hand, traditional cultural beliefs often become the reason for an at-risk community's reluctance to heed official warnings; hence, traditional cultural beliefs often increase a community's vulnerability (Butt, 2014, Lavigne et al., 2008, Schlehe, 1996); this was also an issue for some Merapi residents during the 2010 Merapi eruption (see Chapter One).

Emphasising the positive influences of culture, engagement of the collective cultural values of a community can strongly reduce public outrage in disaster and encourage trust. Giddens (1990, p. 105) explains that the positive influences are closely related with the way culturally-related traditions can provide ontological security:

> Ritual often has a compulsive aspect to it, but it is also deeply comforting, for it infuses a given set of practices with a sacramental quality. Tradition, in sum, contributes in basic fashion to ontological security in so far as it sustains trust in the continuity of past, present, and future, and connects such trust to routinized social practices.

The building of trust, which is based on the cultural and economic concerns embedded in daily behavior towards hazards, is significantly required to ensure community acceptance and facilitate collective participation (Guion et al., 2007, Romo-Murphy et al., 2011, Veszteg et al., 2015, Sandman, 1993, Servaes, 1999, Uslaner, 1999, Widén-Wulff et al., 2008, IFRC, 2015, Troll et al., 2015). Specifically in disaster communication, traditional cultural knowledge can be a useful source in designing information for early warning, because the knowledge represents years of local wisdom about potential threats in a specific region and

skills owned by a specific community in the past (United Nations, 2015, Troll et al., 2015). Moreover, using examples from cases in Ethiopia, Haiti, Pakistan, and the Philippines, the International Federation of Red Cross and Red Crescent Societies (IFRC) (2015) argues that culturally sensitive information, which is connected with the existing local values/belief of hazards, is more valued and prioritized by, and appealing and memorable for the community, because it can fulfil the specific needs of a community.

Regardless of the positive association between cultural values, trust, and collective participation, Fronz (2012)[11] and Hewitt (1983) find that socio-cultural factors have not been thoroughly discussed in most crisis communication theories. Similarly, there have been very limited studies that discuss the direct association of the socio-cultural values of an audience with disaster communication (for example the study of Murayama et al., 2013). Scholars of disaster communication have been increasingly paying attention to science communication in order to increase public scientific understanding; however less attention has been paid to the underlying social factors causing community vulnerability, which can be useful for designing effective disaster communication (Shannon et al., 2014). Not limited to the research level, disaster managers tend to disregard the socio-cultural factors in their disaster risk strategies in practice (Donovan, 2010).

Although some studies (for example the study of Samadhi, 2014) have started raising the importance of a deep understanding of the local context in disaster recovery, the same understanding does not seem to be equally applied in the phase of disaster response. Meanwhile, culture has become one of the determinants of risk perception and evacuation behaviours during a disaster response. In general, risk perception is a function of hazard and outrage, as hazard is a multiplication of magnitude (how bad it is when it happens) and probability (how likely is it to happen), and outrage is an individual's subjective feeling about a hazard (Sandman, 1993, Hollingshead et al., 2007, Nottage et al., 2014). Particularly in a volcanic eruption, individual perceptions of risk and individual evacuation behaviour are often independent of the knowledge of actual hazards, but more closely associated with socioeconomic factors (e.g. accessibility to daily resources) and socio-cultural factors (e.g.

[11] Fronz (2012) specifically analyzed ten crisis communication theories and models: Image Restoration Strategies (Benoit, 1995), Crisis Communication Framework (Coombs, 2007), Situational Crisis Communication Model (Coombs and Holladay, 2002), Crisis Communication Strategies (Cornelisseen, 2008), Crisis Communication Best Practice Guidelines (Fearn-Banks, 2001), Rhetorical Area Micro Model (Frandsen and Johansen, 2010), Issue Management Model (Health and Nelson, 1986), Basis Elements of Crisis Response (Nikolaev, 2010), Anticipatory Model of Crisis Management (Olanivan and Williams, 2001), and Crisis Communication Model (Oliver, 2004).

cultural beliefs, social values, religious beliefs, community traditions, and attachment to place) instead (Lavigne et al., 2008, Donovan, 2010, Gaillard, 2008, Mei et al., 2013). In other words, risk is a social construction of perception of how a hazard will affect people (Gaillard and Dibben, 2008), featuring emotional perceptions, cultural beliefs, livelihood activities, and a connection with a particular hazard location (Bankoff et al., 2015). Additionally, public outrage is also influenced by the authorities' behaviours, the authorities-community interactions, and shared control over risks (Sandman et al., 1993).

As local culture influences the risk perception of an at-risk community significantly, it often leads to a different level of risk perception from outsiders who do not share the same culture. Subsequently, the discrepancy of risk perception frequently creates a gap in priorities between an at-risk community (as the insider) and the local government (as the outsiders) (Bankoff et al., 2015, Sandman et al., 1993), as has happened in the area around Mt. Merapi (Donovan, 2010; Donovan et al., 2012; Dove, 2008; Lavigne et al., 2008; Schlehe, 1996). Unlike the affected community, various organisations involved in disaster risk reduction adopt frameworks of scientific and institutional understanding, and assume that their understanding of significance is also adopted by the affected or at-risk community (Bankoff, 2004). In other words, the authorities often perceive risk solely based on the scientifically actual hazards and adopt the strategy of not dealing with the public's real perception of hazards (Lavigne et al., 2008, Sandman, 1993, Harvard Humanitarian Initiative, 2011, Bird et al., 2009, Mazur, 1981, Mazur, 1990, Jaeger et al., 2007).

Yet, Shannon et al. (2014, p. 641) and Yearley (2005) describe the relationship between scientific rationality and the public's rationality through 'a simple deficit model'. Differently from the scientific approach that is frequently used by the authorities in disaster management, community members are more willing to practise community-generated knowledge based on cultural rationality (Dougall et al., 2008, Harvard Humanitarian Initiative, 2011, Sandman, 1993, Aw, 1992, Donovan, 2010, Donovan et al., 2012). This can be exemplified by the fact that some people consciously decide to live in risky areas and some people want to go back to their homes after they have been struck by a hazard where the hazard(s) may reoccur; those decisions are often questioned by the rationality of the scientific approach (Cannon, 2008, Oliver-Smith, 1986). In practice, community members often put a higher value on their perceived seriousness of a risk rather the actual hazard itself in their decision-making in a disaster response.

If the authorities respond to the discrepancy in risk perception by simply relying on expert-based perception and ignoring indigenous knowledge, it would be elevated into conflict, tension, and misunderstanding between the authorities and the community (Sandman et al., 1993, Mercer et al., 2010, Shannon et al., 2014, Wynne, 1996). Moreover, disconnecting an affected community from their culture (as part of community behaviors and beliefs) may risk losing acceptance from the community and social capital owned by the community, and weakening the community's capacity to cope with a disaster (Bankoff et al., 2015, Cannon, 2008, Dove, 2008).

Therefore, lack of attention to socio-cultural values in disaster communication leads to the second question of this study regarding how culture can be involved in disaster communication in order to encourage trust and community participation in a disaster response. Again, engaging people's culture closely can provide an understanding of how people perceive risk in responding to a disaster (Mitchell, 1995, Smith, 2001, Donovan et al., 2012, Bankoff et al., 2015). Those need to be addressed in understanding the appropriate efforts of disaster communication in disaster-prone areas that are very much affected by the local culture, such as the Merapi volcano in Indonesia, as the case study of this research. The global call to design disaster management into the local context and the culture of the affected area has also been raised by the IFRC (2015) at the Disaster Response Dialogue in Manila in 2014 and the United Nations (2015) at the Third UN World Conference in Japan in 2015.

2.2.2. The roles of the tie strength of social networks in a communication process.

In a disaster response, people eventually rely on their social networks to validate, interpret information and to collectively decide their behaviours (Bunce et al., 2012, Hindman and Coyle, 1999). Diverse scholars have presented that the tie strength of social networks can be associated with information sharing, trust encouragement, and participation. However, how tie strength can be specifically associated with trustworthy and participatory disaster communication has been under-explored. This gap was also acknowledged by Jaeger et al. (2007) who identified that the role of existing local social networks is often less recognised as a supportive factor of trustworthy disaster communication during a disaster response. Some studies have found that involving existing local networks, which consist of local people, may provide recognition of local perspectives in identifying local problems, historical analysis and ultimately solutions in situ (Harvard Humanitarian Initiative, 2011, Moody, 2013). Particularly in disaster response, social networks can provide one-to-one personal

interactions, which are highly beneficial for confirmatory purposes to reduce uncertainty, and help decision-making for evacuation (Steelman et al., 2015, Burkhart, 1991, Lindell and Perry, 1987).

Scholars of social networks mostly identify the strength of network ties as strong ties (for example, the study of Widen-Wulff et al., 2008) and weak ties (for example, the study of Granovetter, 1973). Strong ties are characterized by well-established friendships or close relationships; they are most likely to occur between homogenous community members with spatial proximity where they frequently communicate face-to-face and interact with one another (*Gemeinschaft)* (Bouchillon, 2014, Fisher, 2013, Haythornthwaite, 2005, Uslaner, 1999, Veszteg et al., 2015). Meanwhile, weak ties are extensive social relationships between acquaintances, casual contacts, or community members with shared interests (*Gesellschaft*) (Granovetter, 1973, Fisher, 2013, Haythornthwaite, 2005, Widén-Wulff et al., 2008). Tie strength, both strong and weak, has been thoroughly examined by scholars. However, due to the lack of direct connection between tie strength and disaster communication in previous studies, the role of tie strength in this subsection will be discussed within the general themes of trustworthy and participatory communication: information sharing, trust, and participation. These themes shape the direct connection between the roles of tie strength and individual communication efforts in finding trustworthy disaster information, accordingly.

2.2.2.1. Tie strength and information sharing

During a disaster response, access to the beneficial resources of others through a social network can 'improve coping capacities', 'minimize negative psychological impacts', and 'reduce vulnerability' (Troll et al., 2015, p. 162). In order to be able to gain a valuable information and communication process, an individual must be in contact with others through network ties (Johnson, 2007, Portes, 1998, Rojas et al., 2011). Numerous scholars have agreed that strong ties and weak ties have distinctly important roles in information sharing. Particularly, strongly-tied individuals are effective in facilitating internal information diffusion for collective purposes, because they can decrease cost and transmit information more quickly than weak ties (Opsahl et al., 2010, Putnam, 1993, Putnam, 2000, Uslaner, 1999). In comparison, weakly-tied individuals are less likely to be able to internally diffuse complex knowledge in a particular group (Hansen, 1999). They are more effective for information sharing aimed at reaching a large number of people across different networks, by acting as shorter bridges to reduce network distance and provide access to a range of new

contacts or new resources from the other social networks (Fisher, 2013, Lin, 2001, Widén-Wulff et al., 2008, Granovetter, 1973, Valente and Fujimoto, 2010, Hansen, 1999).

A communication process undertaken with the purpose of obtaining new information is more likely to be achieved through weak ties, which can provide new information from those who are beyond an individual's close network (Johnson, 2007, Granovetter, 1973, Borgatti and Halgin, 2011, Haythornthwaite, 2005). Pelling et al. (2008) and Valente and Fujimoto (2010) explain that an ability to generate novelty is facilitated by a loose structure of weak ties and a lack of ego between weakly tied individuals. This may make an individual more willing to share information with their indirect contacts, and move freely between different clusters in order to access various information sources.

In contrast, collective blindness to new information, information bias, and information redundancy are more likely to happen in a community with strong ties (Nahapiet and Ghoshal, 1998, Hall, 2003, Borgatti and Halgin, 2011, Widén-Wulff et al., 2008, Tutić and Wiese, 2015). These are because the bonding capital embedded in strong ties may grow excessively and lead to an egocentric, introverted, and hierarchical network (Fisher, 2013, Granovetter, 1973). Excessive bonding capital is described as 'amoral familism' by Widén-Wulff et al. (2008, p. 351-352). In practice, the community members are discouraged from interacting with those outside their close network, because they are perceived as 'evils'. Additionally, an information gatekeeper is most likely to be present in order to strategically control information exchange with outsiders, and limit access to internal information resources for the outsiders. In other words, a community with strong ties has strong local cohesion but weak global cohesion (Borgatti and Halgin, 2011).

2.2.2.2. Tie strength and trust

According to Fisher (2013), the Harvard Humanitarian Initiative (2011), Haythornthwaite (2005), Murayama et al. (2013), and Putnam (1993, 2000, cited in Widén-Wulff et al. (2008), individuals with strong ties are considered to embody a large amount of social capital and a high level of trust, which bind them together as a social cement. Moreover, strong ties can encourage a mechanical solidarity as a 'coping capital' (Putnam, 2000; Widén-Wulff et al., 2008, p. 351), which is significant for an affected community in disaster response.

In contrast to the indisputable trust embedded in strong ties, the trust embedded in weak ties has been arguable. Granovetter (1973), Fisher (2013), and Haythornthwaite (2005) have argued that weak ties can encourage trust by providing bridging social capital, which is able

to act as a social leverage; further, weak ties can facilitate collective action and solidarity mobilization. On the other hand, Bouchillon (2014) and Widén-Wulff et al. (2008) have critiqued that the generated trust is thin or practically absent, because weak ties are embodied in an unstable and fleeting network. Hence, individuals require information literacy to master the information shared through weak ties, as the information cannot be automatically regarded as trustworthy.

2.2.2.3. Tie strength and collective participation

In regard to collective participation, it seems that there has been no single agreement on the direct impacts of both strong ties and weak ties. According to Putnam (1993), Rojas et al. (2011) and Uslaner (1999), a dense network of strong ties will decrease self-interest and encourage individuals to collaboratively participate in a collective action. As the strongly-tied individuals share a sense of belonging, they are more willing to work together and exchange resources in order to achieve their collective goals. However, this argument is strongly debated by Widén-Wulff et al. (2008) who argue that strongly-tied individuals often act hierarchically (top-down approach), owing to the well-established structure of strong ties, and this is most likely to prevent collaboration.

Correspondingly, Putnam (1993, 2000, cited in Fisher (2013) and Granovetter (1973, p. 1373) claim that the bridging capital provided by weak ties can generate a social cohesion as a 'sense of community'. Furthermore, the sense can mobilise organic solidarity and encourage individuals to be more willing to participate in a collective action. However, the sense of community is more likely to be temporary because of the instrumental and interest-oriented characteristic of a weak tie; it strongly depends on shared interests and the medium used to connect with other community members. If the instrument or the interest is no longer available, the sense of community is more likely to collapse, and the members are less likely to participate in a collective action (Haythornthwaite, 2005, Miller, 2011).

In summary, diverse studies show the benefits and weaknesses of strong and weak ties regarding information diffusion and trust encouragement and they often debate which are the most effective ones. Although, Borgatti and Halgin (2011), and Widén-Wulff et al. (2008) suggest that strong ties and weak ties may be combined, or a particular tie may become more important without necessarily replacing the other, this depends on the context. The debates on the effectiveness of strong and weak ties and the lack of attention to the role of tie strength in

studies of disaster communication inform the second question in this study: how each type of tie strength encourages trust and collective participation in community-based disaster communication. This particular question needs to be addressed because acknowledging the specific characteristics of social networks, including tie strength, can clarify existing patterns of communication behaviours and predict the communication outcomes (Widén-Wulff et al., 2008, Borgatti and Halgin, 2011, Jaeger et al., 2007). If individuals acknowledge the pattern of communication behaviours, they can have the ability to choose a specific local social network or its combination that can provide the specific information they require, and avoid information overload and exposure to irrelevant information (Jaeger et al., 2007). Therefore, it is important to identify how specific tie strength influences disaster communication, in order to provide a conducive environment for trustworthy and participatory disaster communication.

2.3. Civic participation in community-based disaster communication

Drawing further on the positive effect of a community's social capital on trust establishment, a combination of social ties and information exposure can encourage individuals to participate in social life (Rojas et al., 2011). Hence, this particular section discusses the third question of this study concerning how the affected community participates in disaster communication through media multiplexity. This question needs to be addressed because the knowledge of how community members participate in their social network, empowered with an appropriate medium, can be used to recognize the effective disaster communication that can promote individual capacity in making better life-saving decisions and mobilizing the right types of external support (OCHA, 2013, Winkworth et al., 2009, Rojas et al., 2011). At the community level, the knowledge can promote resident-to-resident assistance and foster coordinated emergency responses throughout a community (Jaeger et al., 2007).

Specifically, the terminology of community participation in this study refers to the studies of Palen (2008) and Palen et al. (2010). They classified community participation in disaster communication into three particular actions: providing useful information, verifying received information, and sharing information to and from multiple sources. However, it seems that there have been very limited studies that actually engage the affected community in the three actions altogether. Previous studies of disaster communication often tend to frame the affected community as a passive and vulnerable party without any further significant roles

than providing information about their needs. This tendency seems to be increasingly popular, as numerous studies (for example, the study of Jaeger et al., 2007) have discussed community participation in disaster communication narrowly in relation to information provided by the affected community and information sharing to general audiences.

2.3.1. Information providing, sharing, and verification

Participation in disaster communication is often closely related to the demand for information during a disaster. In disaster response, BBC (2012), Bunce et al. (2012), Kanayama (2012), Reynolds & Seeger (2005), Seeger et al. (2003), Spence et al. (2006), and Spence et al. (2009) identify that people mostly provide or share information about warnings, evacuation notifications, the scope of damage, governmental responses, rescue and relief efforts, messages regarding self-efficacy, and how to get basic necessities and healthcare. In practice, community members often provide and share information that is regarded as reliable through a cross-channel cluster of media in order to leverage their collective capacities (BBC, 2012, Palen, 2008, Reagan, 1996). The cross-channel cluster of media will be discussed as media multiplexity in the subsequent subsection.

In information sharing, Fronz (2012) identifies that only four theories (out of ten theories he analysed) emphasise defining a target audience in crisis communication. He specifically identifies that the theories of Coombs and Holladay (2002), Fearn-Banks (2001), Heath & Nelson (1986), and Nikolaev (2010) emphasise the unique local knowledge and vulnerability of different communities in defining a specific target audience of a crisis communication. On the other hand, the theories of Image Restoration Strategies (Benoit, 1995), Crisis Communication Framework (Coombs, 2007), Crisis Communication Strategies (Cornelisseen, 2008), Rhetorical Area Micro Model (Frandsen and Johansen, 2010), Anticipatory Model of Crisis Management (Olanivan and Williams, 2001), and Crisis Communication Model (Oliver, 2004) argue that defining a specific target audience is not required in crisis communication.

Unlike the capacities of an affected community in providing and sharing disaster information, the potential role of an affected community in verifying information remains under-explored in disaster communication, both in academic studies and in practice. The efforts of information verification in disaster response still heavily rely on hierarchical formal procedures to collect and analyse disaster information, and media analysis to scan inaccurate information (Harvard Humanitarian Initiative, 2011, Dougall et al., 2008). Disaster-

information sharing, nevertheless, is ‘growing more complex at a faster rate than current tools and human resources can handle’ (Harvard Humanitarian Initiative, 2011, p. 18). As a result, there is an increasing gap between the community expectation for a rapid response to their information and the real analysing time for decision making over the community-originated disaster information (Harvard Humanitarian Initiative, 2011). Thus, owing to constantly-changing uncertainties, rapid information verification still appears to be the biggest challenge in disaster response (Dougall et al., 2008).

In responding to the limitations of communication technology and the hierarchical formal procedures on rapid information verification, the members of the affected community can play an important role in fostering the process of information verification, because the affected community also has ‘ideas about what accountability means’ (IFRC, 2015, p. 189). However, it is important not to simply conclude that the community members are the indisputable verifiers in evaluating the accuracy of disaster information, because the affected community may have self-selection bias and possibly exaggerate information in an extremely stressful situation (Harvard Humanitarian Initiative, 2011). Therefore, this study investigates how community-based disaster communication can be regarded as trustworthy, because of community participation in providing, verifying, and sharing information; the trustworthiness can further encourage rapid decision-making for a disaster response.

2.3.2. Media multiplexity in disaster communication

During a disaster, choosing the right medium to exchange information can be particularly difficult, because many tools of communication (particularly phone and internet-based media) are likely to be either damaged or overwhelmed with incoming and outgoing information (IFRC, 2015, Kodrich and Laituri, 2005). Additionally, referring to Uses and Gratification theory (Rubin, 1994), an individual uses a certain medium to match his communicative purpose, literacy, age, perception, need, cultural preference, and to adapt to the societal system (Ruggiero, 2000, Whiting and Williams, 2013, So, 2012, Hollingshead et al., 2007). Thus, an individual tends to rely on the most convenient media in which they have the most personal interest and trust and are most familiar with, and which have been well-established in the existing information workflows (Austin et al., 2012, Dutta-Bergman, 2004, Dutta-Bergman, 2006, Harvard Humanitarian Initiative, 2011, Steelman et al., 2015, Haythornthwaite, 2005). Moreover, it is important to acknowledge the individuals’ patterns and preferences of media usage because people use media not only as a communication tool, but also as ‘a social tool’ rooted in ‘cultural and social mores’ (IFRC, 2015, p. 201).

However, the practice of disaster communication has not responded appropriately to the unique pattern of media usage of individuals, as people tend to simply assume that everyone uses the same communication technologies in the same way (IFRC, 2015). Similarly, Fronz (2012) finds that only four out of the ten theories of crisis communication he analysed support that communication channels need to be differentiated based on target audience and crisis type. Specifically, he identifies that Fearn-Banks (2001), Frandsen & Johansen (2010), Health & Nelson (1986), and Oliver (2004) suggest that communication channels should be differentiated and selected carefully, based on the target audience and the crisis type. On the other hand, the others claim that communication channels do not need to be differentiated in crisis communication.

The most common response to possibly varied media usage has been in the form of engaging multiple communication technologies in disaster communication (Jaeger et al., 2007). The use of multiple communication channels has been widely recognised as media collaboration in various studies of disaster communication. Yet, the term of media multiplexity has been little used in studies of disaster communication, and has been more widely discussed in regard to social networks (Haythornthwaite, 2005). Although both media collaboration and media multiplexity involve multiple technologies, they are different from each other. Media collaboration refers to a particular platform that includes collaboration between multiple means of communication; whereas media multiplexity refers to the simultaneous usage of multiple means of communication (Haythornthwaite, 2005, Koku et al., 2001). In particular, this study attempts to engage media multiplexity into community-based disaster communication.

In the concept of media multiplexity, the number of communication channels is related to the strength of the network ties of the community. The individuals with stronger network ties incorporate a larger number of channels in their social relationships, in comparison to the individuals with weak network ties (Haythornthwaite, 2005, Igarashi et al., 2005). Specifically, Mizco et al. (2011, p. 21) explains that:

> Overall, consistent with multiplexity, friendship characteristics (i.e., tie strength) were related to different motives for using CMC [computer-mediated communication]; the fact that different aspects of the relationship were related to different motives suggests that strong ties may be more variable than weak ones.

Individuals often use communication channels to communicate with their weakly-tied acquaintances only for the 'purposes of escaping some other activity' (p. 18). In comparison, strongly-tied individuals have the purpose of informational exchange and diverse emotional purposes when they are communicating with each other. They aim at fulfilling the purposes of 'support' (e.g. 'To let this person know I careabout him/her'), 'escape' (e.g. 'To get away from what I am doing'), 'distance' (e.g. 'To keep some distance in our relationship'), 'pleasure' (e.g. 'Because it's stimulating'), and 'compliance' (e.g. 'Because I want this person to do something for me') (p. 17). These diverse communicative purposes mean that individuals use numerous communication channels in different ways.

Owing to the close relationship between media usage and social network, a change in tie strength (e.g. friendship or individual closeness) may affect media usage within a social relationship. Conversely, a channel change (a removal or an addition) will affect the tie strength and the information access (Haythornthwaite, 2005, Miczo et al., 2011). In particular, a channel change is more likely to disrupt existing weak ties, whereas strongly-tied individuals will be less affected by it. If a medium is removed, strongly-tied individuals will find a way to compensate for their loss. Likewise, they are more willing to adopt a new unfamiliar medium if they find it useful for maintaining ties (Haythornthwaite, 2005, Valente and Fujimoto, 2010), although they may resist the additional medium if they find it does not suit them (Yates et al., 1999). In comparison, if a new medium[12] is introduced into existing media multiplexity, it can create new latent ties of a social network, which is labelled the latent tie theory (Haythornthwaite, 2005). The latent ties can technically connect individuals who previously were disconnected socially, or forge new connections that formerly did not exist. If the new technical connections are being maintained with social interventions, the generated latent ties can be transformed into weak ties. Furthermore, a combination of new public medium and person-to-person medium will be more likely to strengthen and transform the weak ties into stronger ties, accordingly (Haythornthwaite, 2005). Yet, this has not been tested in disaster situations, where a different dynamic might apply.

[12] Haythornthwaite (2005) emphasizes that the new medium has to be a public one, and its introduction has to be done by an outsider party.

2.4. Community radio stations as a community-based act of participation

My preliminary study of Jalin Merapi from its website and mass media makes it clear that a study of trust and community participation in the disaster communication during the 2010 Merapi eruption requires consideration of community radio stations. The important role of community radio stations in disaster management has been widely recognised by various scholars. Primarily, a community radio station can be a key source of detailed, real-time, and trustworthy locally-relevant information, which is often unavailable in other media. A community radio station is rated more positively in providing coverage of 'what the victims really wanted to know' (Hindman & Coyle, 1999, p. 13). In addition to its informational role, a community radio station also can provide an important sense of community solidarity and emotional support (Joyce, 2015, Perez-Lugo, 2004).

Unlike most commercial radio stations that have a weak definition of disaster responsibility as a temporary role of information sharing in a disaster response (Birowo, 2009, Fraser and Estrada, 2001, Moody, 2013, Spence et al., 2009), community radio stations have a greater sense of continuous disaster responsibilities in all stages of disaster (Barlow, 1988, Fraser and Estrada, 2001, Moody, 2013, Romo-Murphy et al., 2011, Spence et al., 2009). In the stage of disaster preparedness, community radio stations have a significant role in increasing the level of local disaster preparedness by regularly broadcasting disaster knowledge, such as how to prepare an emergency bag, how to recognize reliable information sources of warning, how to minimize injury, and how to assist others (Romo-Murphy et al., 2011, Tanesia, 2007). In the stage of disaster response, community radio stations can provide timely and continuous news coverage by broadcasting a combination of live call-ins of eyewitness reports from listeners, field reports from news staff, and statements from public officials (Birowo, 2009, Hindman and Coyle, 1999, Kanayama, 2012, Moody, 2013, Sellnow et al., 2002, Tanesia, 2007). Specifically, a community radio station can provide a locally-based early warning regarding a certain affected area; surveillance of updated conditions; information about missing family members; and information about the movement of local relief efforts. Additionally, community radio stations frequently organise disaster volunteer groups, which gather and report information about situations right after a disaster, and distribute aid (Kanayama, 2012, Bachtiar, 2014). Finally, a community radio station can be a medium for community reconstruction in a disaster recovery stage, by providing support and comfort in the trauma healing process, and monitoring aid distributions. In fact, it is also true that all media can do what community radio stations do in disaster stages. Yet, what makes community radio

stations different from other media is their strong potential to be continuous, local, and able to mobilise social network ties for trust in disaster communication.

Specifically, some scholars attribute a radio station's strengths in disaster communication to its ability to sustain critical information during a disaster, due to the portability and the electrical grid independence of a radio receiver, and its broad availability as a household device (Ewart and Dekker, 2013, Moody, 2013, Reynolds and Seeger, 2005). However, I presumed that the strengths of a community radio station do not depend solely on the resilience of radio broadcasts during a disaster or its characteristics as mass media. Hindman and Coyle (1999) describe that the disaster communication provided by a community radio station is indistinguishable from interpersonal communication between the broadcasters and the listeners. Following Hindman and Coyle, I presumed that the strengths of a community radio station also lie in the interpersonal relationships between the broadcasters and the community members they serve. The ability of a community radio station to provide trustworthy local information is also likely to result from the localised characteristics of its community-based communication system, particularly cultural community identities and the sense of community ownership. These are more likely to manifest the social capital of the community a radio station serves, so that the community members may feel closer to the community radio station during a disaster response (Hindman and Coyle, 1999). Therefore, in this section, I draw out the connections between the literature on community radio stations and literature on community social capital, particularly the culture-embedded communication and the social network previously discussed, in regard to their associations with trustworthy and participatory community-based disaster communication.

2.4.1. Culture-embedded broadcasts of community radio stations.

This subsection will further discuss the culture-embedded broadcasts of community radio stations. Previous studies show that the consistency of local cultural engagement in community radio stations' broadcast is able to strengthen local identities and increase a community's enthusiasm for participating in community radio stations' broadcast (Carpentier et al., 2007, Jankowski, 2002, Kanayama, 2012, Lindsay, 1997, Sen, 2003). Thus, the culture-embedded broadcast of community radio stations can support the relationship between culture-embedded disaster communication and trust establishment at the community level.

A close attachment to local culture often differentiates a community radio station from other mass media. The cultural identity in the broadcast of a community radio station often has the

biggest impact on its listeners; most listeners often expect to listen to cultural entertainment (e.g. traditional music, story-telling, poetry, customs, and traditions) when they decide to listen to a community radio station (Berque, 1992, Valenzuela, 1992). Moreover, the cultural programs are often regarded as a 'collective cultural expression' rather just a form of entertainment (Fraser & Estrada, 2001, p. 16). A community radio station often acts as a personalised communication link with a very high listenership by emphasising cultural identities and responding to the specific needs of its target audiences (Day, 2009, Moody, 2013, Valenzuela, 1992, Foy et al., 1992, Mohr, 1992). Specifically, Fraser & Estrada (2001, p. 5) argue that:

> Community radio works in the cultural context of the community it serves; it deals with local issues in the local language or languages; it is relevant to local problems and concerns; and its aim is to help the community to develop socially, culturally, and economically.

Despite wide-ranging discussions of community radio stations by various scholars, the culture-embedded broadcasting of a community radio station has not been thoroughly studied in regard to its relationship with community-based disaster communication. So far, the culture-embedded broadcast has only been associated with attempts by community radio stations to be a part of and strengthen communal cultural identity (Mohr, 1992, Day, 2009, Jurriëns, 2003). In fact, Tanesia (2007, p. 75) found that some community radio stations deliberately broadcast cultural entertainment, such as *Pantun* (traditional poetry), *Nazam* (Aceh folktales), and Javanese songs to comfort the refugees in some natural disasters in Indonesia. However, how the culture-embedded broadcast may influence the trustworthiness of community disaster communication has been less explored.

2.4.2. The broadcasters of community radio stations as local actors.

Humanitarian organisations, which mostly comprise outsiders, often face difficulties in establishing trust and identifying trusted networks within the affected community (Harvard Humanitarian Initiative, 2011, Murayama et al., 2013). This is particularly so because trust establishment is a long-term process that includes a history with a specific audience. It is not easily attained by outsiders who arrive into a disaster-affected neighbourhood shortly after a disaster has occurred. Again, Bankoff et al. (2015) add that outsiders cannot easily comprehend the everyday culture at the community level.

In responding to this difficulty, Antonovsky (1987), Dougall et al. (2008), Ferrante (2010), IFRC (2015), and Widén-Wulff et al. (2008) suggest that the outsiders should engage the

local people. In addition to proximity familiarity with the affected area, local people can identify useful local knowledge of information behaviours to foster the process of local rapport, accelerate the process of trust establishment, and encourage local cooperation, which outsiders usually struggle with. For example, they can identify the local informal information sources, the internal rules in their information environment, how group identity affects their knowledge sharing, and the social construction of knowledge, such as how their groups gather, analyse, process, store, use, and re-use information. Moreover, local actors can 'draw on pre-existing contacts with people of influence' (Austin et al., 2012; Harvard Humanitarian Initiative, 2011; Shannon et al., 2014, p. 639).

The broadcasters of community radio stations are part of the affected community, living among their listeners in the affected area. In practice, they share the same reality faced by the victims, understand the local perspectives and are able to identify the local problems and voice the victims' interests accurately (Birowo, 2009, Birowo, 2010, Day, 2009, Fraser and Estrada, 2001, Moody, 2013). Without this knowledge, outsiders might 'incorrectly' choose the information sources with inappropriate network ties (Borgatti & Halgin, 2011, p. 1169), and this certainly results in ineffective disaster communication. Furthermore, engaging community radio broadcasters, who are part of the local community, may significantly reinforce trust building within the affected community.

2.4.3. Participatory mechanisms of community radio stations.

This section focuses on the participatory mechanisms of community radio stations. This selection is made particularly by considering studies showing the historically fundamental roles of community radio stations in encouraging and enabling community participation, as a response to the difficulties in finding local identity, communicating, and participating in decision-making at the grassroots level (Foy et al., 1992, Day, 2009, Carpentier et al., 2007, Dagron, 2007, Hollander et al., 2008, Berque, 1992, Chateau-Degat, 1992, Rennie, 2006). Specifically, Hochheimer (2002, p. 319) describes community radio stations as community-based participatory media that can support localised issues, as below:

> [C]ommunity-based participatory media…provide substantial hope that people can best make decisions affecting their own futures if provided with the contexts within which to establish media for themselves to address their own problems as they construct them.

In disaster communication, Hindman and Coyle (1999), and Kanayama (2012) identify that a community radio station can provide an active means for community participation in exchanging information and responding to other community members.

The studies of Day (2009), Jurriëns (2003), and Sen (2003) describe that a radio broadcast can provide a degree of interactive participation for its listeners through a range of forums of discussion or talkback. In a profound way, a community radio station does not limit its encouragement of participation to its on-air broadcast. It expands its mechanisms of voluntary participation by establishing an equal relationship, a continuous dialogue, and horizontal communication with its listeners (Birowo, 2006, Jurriëns, 2003, Moody, 2013). Additionally, a community radio station grants its listeners active roles in programme production, radio management, and radio ownership (Carpentier et al., 2007, Day, 2009, Foy et al., 1992, Fraser and Estrada, 2001, Hindman and Coyle, 1999, Hochheimer, 2002, Moody, 2013, Valenzuela, 1992). In other words, a community radio station is owned and managed by the community members themselves; the programmes are produced and broadcast by the listeners in a participatory way.

Moreover, a community radio station also has structural characteristics that are beneficial in stimulating the participation of its listeners. They are: (1) its localized management by local people, who understand the local realities and cultural identity; (2) its limited coverage, which simplifies broadcasting issues based on the listeners' specific needs; (3) its independent status, which allows it to freely accommodate local interests and needs; (4) its accessibility, due to the geographic proximity of the radio station (5) its networks of potential local correspondents, which make its broadcast more reliable (Abdurrahman, 2013, Berque, 1992, Birowo, 2006, Fraser and Estrada, 2001, Valenzuela, 1992). In addition to those characteristics, the culture-embedded broadcast of a community radio station can also simplify the requirements of participation. Community members are able to simply participate in an authentic manner based on their own traditions, customs, and cultures by using their own languages accordingly (Jankowski, 2002). Furthermore, the available participatory mechanisms can eventually develop a communal perception and encourage individuals to participate in a collective action in social life (Flint and Luloff, 2007, Fraser and Estrada, 2001, Jurriëns, 2003, Waxman, 1973, cited in Moody, 2013). Servaes (1999, p. 260) even labels a community radio station as 'an act of participation' of a community.

However, community radio stations have not been regarded as a mature support/ instrument for disaster communication in Indonesia, regardless of being recognised for their long history. Tanesia (2007) found that the Indonesian community radio stations had facilitated an inadequate participation in disaster communication prior to the 2010 Merapi eruption. The community radio stations simply broadcasted the text messages provided by the affected community, without necessarily engaging them into further roles, such as information verification. They frequently simply quoted the information that was published by mass media, meanwhile, their news content might be incorrect and too general to be quoted. Thus, the literature on the participatory broadcasting of a community radio station may not be able to provide a comprehensive description of the practice of community participation at the community level in a disaster communication environment.

Therefore, this study does not narrowly investigate the relationship between the culture-embedded and participatory broadcast of community radio station, and trustworthy and participatory community-based disaster communication. This acknowledges the fact that the broadcasters of community radio stations are actually the members of the affected community. Thus, there is a big possibility that they may not be able to broadcast right after a disaster occurs, and may have to struggle to physically rebuild or get a new studio to be back 'on-air' (Joyce, 2015, pp. 63, 65). If their roles in disaster communication rely on their on-air broadcast, they certainly become ineffective when they are off-air. Additionally, a community radio station may differ from other community radio stations in the culturally-embedded broadcasts they play (Day, 2009). Moreover, the strong ties of the broadcasters may or may not lead to reinforcement of community ideology rather than generating new knowledge. If this study only focuses on a specific cultural program of a particular community radio station, the arguments are less likely to be able to be applied generally in other cases of community-based disaster communication.

2.5. Conclusion

This study is attempting to build a theoretical framework for understanding trustworthy and participatory community-based disaster communication. Specifically, a theoretical framework of the relationships between the social capital (the culturally-embedded communication and the tie strength of a social network, to be precise) owned by the affected community, trust encouragement, and community participation in disaster communication. In

the case study of this research, the culturally-embedded communication and the tie strength being studied are embedded in the characteristics of community radio stations, whose volunteers are the main providers of the community-based disaster communication of the Jalin Merapi network, as the representatives or extensions of the social capital owned by the Merapi people.

Chapter 3

Methodology

This chapter sets up the methodological framework adopted in this research in order to construct an integrated and comprehensive theoretical understanding of trustworthy and participatory community-based disaster communication. The chapter starts with an explanation of the constructivist epistemology and the interpretivist ontology of this research. The epistemological and ontological positions have become the grounding logic for the selection of the qualitative methodology in this research. Further, the explanation is followed by the rationale for adopting the constructivist grounded theory of Charmaz (2003, 2006) and the case study of Yin (2009) in this research. The chapter progresses to discuss the research design and data collection utilizing the methods of in-depth interview and focus group. It also describes the gaining of access to research participants, the practices of conducting in-depth interviews and focus groups, and how research obstacles were overcome. Subsequently, the methodological processes of grounded theory used for analyzing data, which are coding, constant comparative analysis, and memo writing, are explained thoroughly. The data analysis is aimed at elaborating the conceptual connections between the data categories of social capital of the affected community, trust, and community participation into a theoretical understanding of trustworthy and participatory community-based disaster communication. Finally, the chapter ends with a discussion of the ethical requirements met in order to protect the research participants.

3.1. Constructivist and interpretivist paradigms

This study aims at constructing a holistic understanding of trustworthiness and participation in community-based disaster communication, by significantly referring to the heterogeneous subjective interpretations of research participants (Creswell, 2009, Patton, 2002). Importantly, I have acknowledged that their individual interpretations are closely associated with the relationship between the affected community and their everyday socio-cultural context (Guba and Lincoln, 1982), and their previous experiences of disaster communication regarding the Mt. Merapi eruption (Creswell, 2009, Patton, 2002). The perspective has underlain my position in the epistemological and ontological paradigms, which strongly

constitute knowledge and the theoretical perspectives of research methodology accordingly (Crotty, 1998).

Epistemologically, I have positioned myself in the constructivist paradigm, understanding social knowledge as not discovered but constructed within the transactional, close, and direct interaction between researcher and research participant (Crotty, 1998, Guba and Lincoln, 1994, Ponterotto, 2005, Patton, 2002, Polit and Beck, 2010). Aligned with the epistemological position of a constructivist, I have endorsed an ontological position of an interpretivist/relativist. I have perceived social realities as human products of knowledge, which are contextually and subjectively interpreted by an individual based on his/her historical experiences, culture, education, and age in their natural daily settings (Charmaz, 2006, Corbin and Strauss, 2008, Guba and Lincoln, 1989, Levers, 2013, Lincoln and Guba, 2003, Bogdan and Taylor, 1975). The interpretivist paradigm informs symbolic interactionism, which includes researchers' attempts to understand how research participants construct their interpretations of realities and, further, to understand the participants' actions upon their interpretations (Charmaz, 2006). Thus, I did not focus on a single perspective of either the research participants or myself, because a common theoretical understanding is less likely to be constructed in a single interpretation of a single reality; the understanding of the same reality may be personalized differently or similarly among individuals (Levers, 2013, Crotty, 1998). Therefore, based on my epistemological and ontological perspective, I define the knowledge of trustworthy and participatory community-based disaster communication generated in this study as a collaborative understanding between the participants, in regard to their interpretations of their lived experiences of disaster communication, and me as the researcher, in regard to my understanding of the interpretation of the research participants.

Epistemological and ontological positions are the foundations that distinguish the two most dominant approaches, which are the qualitative and the quantitative methodologies, in academic research (Bryman and Bell, 2007). In particular, my perspectives of constructivist epistemology and interpretivist ontology strongly determined the selection of the qualitative design for this research (Crotty, 1998, Guba and Lincoln, 1994). Specifically, this study was conducted using the grounded theory methodology for not aiming at verifying pre-existing theory (Bunce et al., 2012, Glaser, 1998, Birks and Mills, 2011, Goulding, 2002, Corbin and Strauss, 2008, Charmaz, 2006, Miller and Salkind, 2002, Moustakas, 1994, Strauss, 1987, Glaser, 1978). As there are some paradigms of grounded theory that have distinguished methodological strategies and methods for data analysis (Bryant and Charmaz, 2010, Levers,

2013, Mills et al., 2008), the epistemological position of researcher also influenced the selection of the particular paradigm of grounded theory used in this study.

3.2. Constructivist grounded theory

Epistemologically adhering to the constructivist paradigm, this research specifically has adopted the constructivist grounded theory of Charmaz that rests heavily on the interpretative paradigm and symbolic interactionism in producing a theory. With regard to her approach, Charmaz (2006, p. 10) describes it as follows:

> I assume that neither data nor theories are discovered. Rather, we are part of the world we study and the data we collect. We *construct* our grounded theories through our past and present involvement and interaction with people, perspective, and research practice. My approach explicitly assumes that any theoretical rendering offers an *interpretive* portrayal of the studied world, not an exact picture of it.

Being built upon the principles of symbolic interactionism, constructivist grounded theory emphasizes that constructing a theoretical understanding of the phenomenon studied entails acknowledging how the values, beliefs, feeling, and ideologies of an individual influence their interpretation of meaning and actions in a specific situation and is not solely gathering facts of the external world (Charmaz, 2006, Goulding, 2002, Miller and Salkind, 2002). In other words, the emergent conceptual theory in constructivist grounded theory results from the interpretations of the researcher and research participants of 'meanings and actions' (Charmaz, 2006, p. 131; Levers, 2013). Therefore, the generated theoretical framework of this thesis is constructed based on my interpretative understanding of the stories of the research participants, and the shared experiences and the relationship between the research participants and me during data collection (Charmaz, 2006, Mills et al., 2006, Hayes and Oppenheim, 1997).

This study does not solely follow either the approach of Glaser or the approach of Strauss or their collaborative approach; despite grounded theory being originally developed by Barney Glaser and Anselm Strauss in their book *The Discovery of Grounded Theory* (1967). Regardless of Glaser's (1978, 1992, 1998) initial critique of the objectivist epistemology, his theory of discovery resembles the quantitative methods with his 'dispassionate empiricism' and rigorously 'codified methods' of comparative work (Charmaz, 2006, p. 127; Levers,

2013, p. 1). Thus, the strong tendencies of Glaser towards the positivist ontology and objectivist epistemology are not suitable for this study, which applied a qualitative research design. Correspondingly, although Strauss has started to acknowledge the interpretivist view in constructing theory and has placed more emphasis on listening to the research participants in order to verify the emergent conceptual relationships (Strauss and Corbin, 1998), his approach still inclines towards a positivist perspective of explanation (Charmaz, 2006). Thus, the pragmatism approach of Strauss (1987) is also regarded as unsuitable for this study.

In addition to the epistemological ground, some practical benefits have motivated the selection of the methodology of grounded theory in this study. Grounded theory provides a comprehensive understanding of the phenomenon being studied directly from the specific context of inquiry, its time, place, culture, and situation (Charmaz, 2006, Glaser, 1978, Stern and Porr, 2011). As the data of this study are grounded inductively in the natural context of the social phenomenon being studied, complete and in-depth explanations of data are able to emerge with contextual significance (Guba and Lincoln, 1982, Miles and Huberman, 1994). Therefore, by adopting grounded theory, I have been able to construct an integrated theoretical formulation that gives a comprehensive understanding of how the affected communities living in the Mt. Merapi surroundings responded to the 2010 Merapi eruption by developing a localized and trustworthy community-based disaster communication process.

Additionally, grounded theory is practical when the existing explanations/theories are inadequate to capture the complexity of the phenomenon being studied (Miller and Salkind, 2002, Salkind, 2010). As discussed in the literature review in Chapter Two, there has been a lack of attention in previous studies to the perspective of the affected community in disaster communication; particularly, how disaster communication is regarded as trustworthy by the affected community, and how it can increase collective participation. Hence, through constructivist grounded theory the interactions between the research participants and I can construct the framework/theory required to interpret the complexity of the concept of trustworthy and participatory community-based disaster communication. Finally, the flexibility of grounded theory is appropriate in responding to the practical issues surrounding the qualitative research. According to Charmaz (2006) and Glaser (1998), grounded theory offers flexibility to a researcher in collecting data, generating conceptual categories, and analyzing data, although it still has a structured and rigorous approach. This flexibility is

particularly beneficial in providing a 'tolerance for feeling out of control' in a qualitative study such as this one (Glaser, 1998, p. 11).

3.3. The case study: The Jalin Merapi network in the 2010 Merapi eruption

The design of a case study is also able to provide a comprehensive understanding of a social phenomenon or a bounded entity (or entities) within its real social and cultural context (Putney, 2010, Yin, 2009). Hence, a case study is particularly suitable for a study that specifically focuses on the disaster communication process within the affected community in its natural context. In order to gain a comprehensive understanding of community-based disaster communication, I selected a case study of a community-based information network called Jalin Merapi (*Jaringan Informasi Lingkar Merapi* – Information Network of Merapi Circle). The Jalin Merapi network was used by the affected communities living on the Mt. Merapi slopes in an attempt to provide community-based disaster communication during the Mt. Merapi eruption, which happened from September – November 2010 in the Provinces of the Special Region of Yogyakarta and Central Java, Indonesia. This particular case study has been chosen as an example that resembles the theoretical sampling of trustworthy and participatory community-based disaster communication (Charmaz, 2006). Additionally, I selected the Jalin Merapi network because it demonstrates the circumstances and conditions of the way local communities can take an important role in formal disaster management (OCHA, 2013, BBC, 2012). Moreover, the case study of the Jalin Merapi network was selected for a general understanding of trustworthy and participatory community-based disaster communication, which may be instrumental in informing the policies of disaster management.

Yet, a single-case study is often considered to be less generalizable and less robust than multiple-case studies (Putney, 2010, Yin, 2009). Therefore, this study does not limit its unit analysis to a particular social unit of the Merapi community in a particular district. The Merapi people and the relevant authorities are constrained by four different administrative districts. Thus, focusing on one particular district in Mt. Merapi may not be sufficient to represent the other districts in the Mt. Merapi surroundings and the heterogeneity of social elements of disaster communication within the affected community. For the purpose of wider relevance of the study's findings, the data collection of the study was conducted in four

different districts in the Mt. Merapi surroundings to look holistically at the Jalin Merapi network.

Moreover, this study was designed with embedded units of analysis in order to explore disaster communication both at the government level and the affected community level. As the embedded analysis units, research participants were the officials of the district governments and the segmented parts of the Merapi community. Therefore, I assumed that the embedded units of analysis and the multiple locations were more likely to provide a broader understanding by representing heterogeneous views about trustworthy and participatory community-based disaster communication. Again, comparing the responses of various research participants across different groups is useful for validation purposes, as 'people are not neutral or mistake-free reporters of their own experience' (Lindlof & Taylor, 2002, p. 172). Additionally, according to Charmaz (2006), grounded theory, as used in this study can result in empirical generalization, by inductively connecting the contextualized concepts of the case study to the larger social structure.

3.4. Theoretical Sampling

Prior to the data collection of the study, Charmaz (2006, p. 100) suggests defining initial sampling by establishing 'sampling criteria for people, cases, situations, and/or settings' as the starting point. Within the context of a grounded theory study, recruiting research participants is conducted through theoretical sampling for theoretical purposes, as theoretical sampling aims at finding the most suitable data to elaborate and refine the emerging conceptual categories (Charmaz, 2003, Charmaz, 2006, Glaser and Strauss, 1967).

From the theoretical perspective, the study is designed to investigate both formal disaster management at the government level, and communication capital of the affected community that can facilitate trustworthy community-based disaster communication in a disaster response. Therefore, I have outlined some parameters in defining the research participants to ensure their theoretical suitability for the purposes of the study. The first parameter is the theoretical relevance of the recommended interview, which means that they can contribute a substantive insight into the theory being generated because they had experienced or were the representatives of the phenomenon being studied (Lindlof and Taylor, 2002, Miller and Salkind, 2002, Salkind, 2010). As the research is also concerned with the nature of social

media usage during the 2010 Merapi eruption, convenience sampling was employed to ensure that participants were aware of social media, had experienced social media, and had access to an internet connection (including through a mobile phone).

Moreover, the other parameter of selecting the research participants was also related to their geographic locations. The case study's focus on the Mt. Merapi eruption automatically determined the locations of the research participants. The Merapi volcano is administratively located in four districts: Sleman (administratively under the province of Yogyakarta Special Region) and Klaten, Magelang, and Boyolali (administratively under the province of Central Java) in Indonesia. Thus, the research participants were specifically local members who were living in those particular areas. Based on the parameters, the research participants of the study were categorized into two distinct groups: the local community members who participated in the Jalin Merapi network during the 2010 Merapi eruption, and the officials of local governments who were responsible for the official disaster management. The group of local community members initially consisted of the representatives of Jalin Merapi volunteers, the representatives of community radio volunteers, and the representatives of the Combine Resources Institute (Combine).

3.4.1. Gaining access to the research participants

Following the process of defining the research participants, gaining access to participants was another fundamental prerequisite for undertaking the study, as it may influence the reliability and validity of the data that a researcher subsequently obtains (Burgess, 1984, Bogdan and Biklen, 2007). Prior to the data collection, I was physically located in New Zealand. Thus, the only possible means of finding relevant materials about the Jalin Merapi network and making contact with Indonesia was through the internet-based media. I found that the website of the Jalin Merapi network (www.merapi.combine.or.id) was a subdomain of the website of Combine Resources Institution (Combine), a Non Goverment Organisation in Yogyakarta city located 30 kilometres away from Mt. Merapi. Thus, I assumed that Combine might be a suitable and credible representative to help me gain access to the Jalin Merapi network. Using this approach, the initial contact was made with Combine through email to briefly outline the study. Further, in December 2013, I conducted a preliminary meeting with a manager who worked at Combine where I initially confirmed the close relationship between Combine and the Jalin Merapi network; Combine has been working together with some community radio stations in the Mt. Merapi area in establishing the Jalin Merapi network since 2006. I further

requested from the manager information on how to gain access to the potential participants who were involved and actively participated in the Jalin Merapi network during the 2010 Merapi eruption. Subsequently, he identified some broadcasters of community radio stations who might be suitable for the study and recommended me to contact them. After contacting the first broadcaster, the selection of the subsequent interviewees continued with snowball sampling.

3.4.2. Snowball Sampling

In determining the research participants, I utilized non-probability sampling, particularly snowball sampling. The research participants, who were initially interviewed, were asked to recommend a subsequent potential research participant (Bryman and Bell, 2007). All former interviewees deliberately recommended someone they knew who might suit the research context. Based on the recommendation, I afterwards made preliminary phone contact with the potential interviewee in order to explain my research and ask for their willingness to be interviewed. I emphasized that they could refuse to be interviewed if they were not comfortable with my research. I also addressed any questions they asked in regard to the study. In practice, I faced one objection from a potential research participant. Thus, the personal information gained from the referrer was not used in this study.

As soon as the obtained data were likely to be able to define preliminary concepts, I conducted early data analysis simultaneously with the theoretical sampling (Charmaz, 2006). As data analysis is conducted simultaneously with data collection, the result of the generated data analysis determines 'what group or subgroup does one turn to next in data collection' in such a progressive direction (Glaser, 1978; Glaser & Strauss, 1967, p. 47). Specifically, by conducting memo writing and constant comparison in data analysis, I could identify the incomplete categories and the gaps evident in the early categories and their associated properties while conducting theoretical sampling. As a result, I might identify additional data needed, which were not covered previously, and how to gather the additional data in order to fill in the identified gap or to illuminate a category (Bryant and Charmaz, 2010, Charmaz, 2006, Corbin and Strauss, 2008, Hansen, 2009).

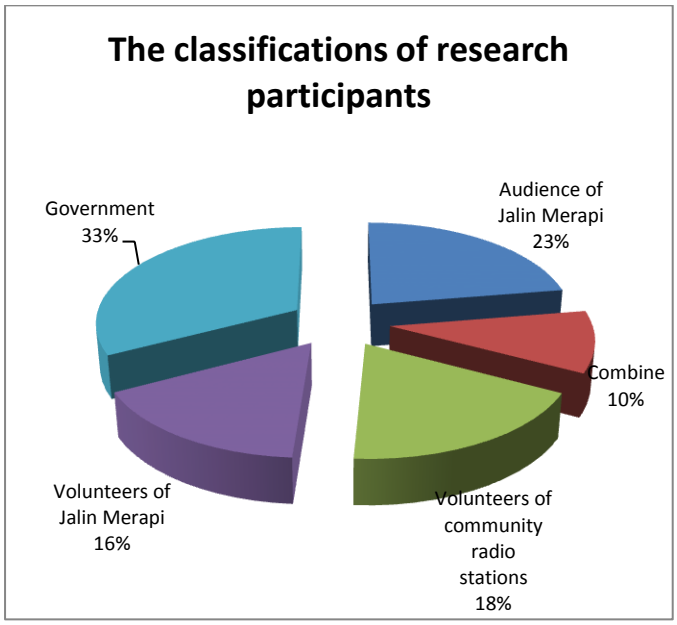
In practice, my early analysis revealed that the emerging categories of the trustworthiness and effectiveness of the Jalin Merapi network did not fully account for the empirical experiences of the affected community. I identified that the initial groups of community members (the

Jalin Merapi volunteers, the community radio volunteers, and Combine) provided a somewhat similar tone about the trustworthiness and effectiveness of the Jalin Merapi network. Yet, I needed to gain another perspective to contrast the data already collected. Thus, I decided to add a group of Jalin Merapi audience members, who were the community members living on the surrounding Merapi slopes and had passive experiences with the Jalin Merapi network in the 2010 Merapi eruption. To distinguish this group from the Jalin Merapi volunteers, they did not actively participate in the Jalin Merapi network to provide or verify the information, but kept themselves updated with its information. They might use the information from the Jalin Merapi network for their personal reference or their personal consideration when giving donations.

The perspectives of the Jalin Merapi audiences, which might confirm or be opposed by the other groups, could be an effective way of avoiding an easy conclusion from the study. In other words, the group of the Jalin Merapi audiences can define more specific forms of variation in how community members (between those who actively participated in the Jalin Merapi network and those who passively acted as the Jalin Merapi audiences) perceive the effectiveness and the trustworthiness of the Jalin Merapi network. In addition to the substantive contribution, adding the new group of the Jalin Merapi audience members required 'further clearance with institutional committees' (Charmaz, 2006, p. 111). Thus, I submitted a request for an amendment for the addition of the group of the Jalin Merapi network to the Human Ethics Committee of the University of Canterbury and it was approved.

Unlike the other groups of community members where an interviewee was more likely to recommend someone in the same group of participants (although it is not always the case), the snowball sampling for the Jalin Merapi audience group was based on the recommendations of the other groups of participants, such as the volunteers of community radio stations or the volunteers of the Jalin Merapi network. As part of the local community, the community radio volunteers knew the individuals in their own community who were interested in getting information from the Jalin Merapi network. The audience members might ask them for any updated information from the Jalin Merapi network or for further information that was previously mentioned on it. Meanwhile, the volunteers of the Jalin Merapi network suggested those individuals who contacted them for detailed information about refugees in order to give donations after the 2010 Merapi eruption.

The flexibility of theoretical sampling does not only apply to the decision on the possibility of an additional group, but also in regard to the number of participants in each group. The number of research participants cannot initially be definable, because the decision does not necessarily aim at reaching a particular number that statistically represents the population of the Mt. Merapi surrounding area. Instead, the theoretical sampling reflects the emerging categories and their properties (Charmaz, 2006). Hence, I kept recruiting the research participants as long as the data obtained still contributed to the emergence of a new category in the simultaneous data analysis. I discontinued the theoretical sampling once the simultaneous data analysis had reached the point of theoretical saturation (Charmaz, 2006, Corbin and Strauss, 2008). For data collection, I conducted 35 in-depth interviews and two focus groups attended by 14 participants, as described in the diagram below.



Participants	Number
Audience of Jalin Merapi	11
Combine	5
Volunteers of community radio stations	9
Volunteers of Jalin Merapi	8
Government	16
Total	**49**

Figure 3. The classifications and numbers of the research participants.

3.5. Data Collection

In gathering data, I utilized multiple research methods, which were the in-depth interview and the focus group interview. Yin (2009) and Marshall and Rossman (2011) support the use of multiple research methods in order to construct validity. Similarly, Glaser (1998) agrees that gathering data from rigorous research methods is consistent with the systematic generation of theory in grounded theory. In particular, in responding to Charmaz's (2006) suggestion of deeply considering the research problem in choosing the research methods, the methods of in-depth interview and focus group interview are suitable for facilitating the scope of research

in revealing the participants' experiences, feelings, and perspectives of trustworthy disaster communication in their life context (Charmaz, 2006, Lindlof and Taylor, 2002, Miller and Salkind, 2002, Seidman, 2013, Donovan, 2010).

Again, I could not utilize real-time methods such as observation because of the time constraints of the case study. Thus, interviews were more suitable for inquiring about past events and recalling the participants' memories of the Merapi eruption that occurred five years before (Lindlof and Taylor, 2002). Moreover, the interview method is also able to result in a comprehensive understanding of the complexity of the social phenomenon by providing proximity (Corbin and Strauss, 2008), as well as flexibility and inherent control for an incisive data analysis that fits the strategies of grounded theory (Charmaz, 2006). In addition to the suitability of research methods, the research design was also partly influenced by the financial resources available for this research which was partly funded by New Zealand Aid and self-funding. How the financial resources influenced the research methods will be described in detail in the next sub-sections.

For the case study of the Mt. Merapi eruption that happened from September – November 2010, the data collection was initially scheduled for February 2014. The time frame of different months was selected purposely in order not to cause a reliving of the traumatic experiences of the research participants. However, the conduct of the data collection had to be postponed twice. The first delay was caused by the eruption of the Kelud volcano, which is located approximately 300 kilometres away from the Merapi volcano. The thick ash from the Kelud eruption affected the community members, who were the potential research participants. Thus, I postponed my data collection and waited until the communities had recovered from the thick ash. However, when the Merapi people were fully recovered, I still could not conduct the data collection process because of the increasing activity of the Merapi volcano. At that time, the status of the Merapi volcano was officially raised to Alert (*Waspada).* It caused high tension within the local communities, who were mostly traumatized as a result of the 2010 Merapi eruption, and they had to be prepared for evacuation. Out of respect for the communities' situation, I, again, postponed the data collection. Fortunately, the status of Merapi was lowered a few weeks later, so the data collection could be performed in April 2014. Despite the delay, the situation was actually in my interest as the research participants were more eager to discuss their experiences of the Merapi eruption and I had a chance for personal observation of information sharing regarding the status of Mt. Merapi.

3.5.1. Semi-structured in-depth interview

By adopting the constructivist grounded theory, I aimed to construct a dialectic understanding and interpretation of trustworthy community-based disaster communication as a result of the researcher-participant interaction. In order to achieve the ultimate objective, Lindlof and Taylor (2002) and Tripp (1983) emphasize partnership, equal power and mutually shared perspectives between the participants and the researcher. Therefore, the semi-structured in-depth interview was selected as a suitable method in order to establish the intended equal relationship between the interviewees and me (Goulding, 2002), and to facilitate an unconstrained discussion where the interviewees could respond to inquiries without any pre-arranged boundaries (Burgess, 1984, Charmaz, 2006).

In practice, the main focus of the interviews was to understand the subjective experiences, views, and actions of the participants, according to their own perspectives without any guidance from the interviewer (Charmaz, 2006). Hence, I developed a non-directive interview guide consisting of some open-ended questions. The interview guide was useful in helping me concentrate on the participants' words, rather than splitting my concentration to conjecture the next appropriate question (Charmaz, 2006). Unlike the tight control of a researcher in the structured interview, the semi-structured interview offers flexibility that can be serendipitous to identify any formerly unanticipated topic outside the list of predetermined questions (Charmaz, 2006, Burgess, 1984, Lindlof and Taylor, 2002). The loose template of interview questions allowed me to ask additional questions or alter them in various ways (e.g. rephrase or break them up into several detailed questions) (Charmaz, 2006, Lindlof and Taylor, 2002). Moreover, the flexibility is particularly significant in adapting to the social dynamic of interviewing and the possibly different interview contexts from one participant to another.

Differently from general qualitative interviewing, grounded theory interviewing might alter as the study progresses (Bogdan and Biklen, 2007, Charmaz, 2006). After some initial interviews, I started analyzing the initial data and identified any potential changes in the interview questions as a result of the initial findings. Specifically, the questions of the initial interviews were related to a range of issues and aimed at gaining a broad understanding of trustworthy and participatory disaster communication. Later, I proceeded with subsequent interviews with more specific questions than the earlier ones. As the data collection

progressed and conceptual categories emerged, I repeated the same pattern until I reached theoretical saturation.

In total, 35 semi-structured in-depth interviews were conducted (see Appendix A for the interview schedule) to identify a range of issues related to how the Jalin Merapi network facilitated the trustworthiness and the participation of the local community members in community-based disaster communication, the flow of information providing and sharing, the mechanisms of information verification, the volunteering mechanism, and the engagement of community radio stations. The interviewees were categorized into five groups with the aim of addressing different themes of the interview questions for each category of participant. Specifically, the groups consisted of:

1. Five representatives of the Combine Resources Institution (Combine) staff members, as the non-government organization that facilitated the establishment of the Jalin Merapi network. This group was interviewed regarding the establishment of the Jalin Merapi network, the involvement of community radio stations in the Jalin Merapi network, and the government support in community-based disaster communication (see Appendix A for the list of questions).
2. Nine representatives of five community radio stations that were closely involved in the Jalin Merapi network during the 2010 Merapi eruption. They are a representative of Lintas Merapi FM, a representative of MMC (Merapi Merbabu Community) FM, four representatives of K FM, a representative of Lahara FM, and two representatives of Gema Merapi FM. This group was interviewed regarding the perceived disaster responsibility owned by the community radio stations, the cultural and participatory approaches in radio broadcast and disaster communication, the involvement of the community radio stations in the Jalin Merapi network, and the roles of the community radio stations in encouraging and facilitating community participation in the Jalin Merapi network during the 2010 Merapi eruption (see Appendix A for the list of questions).
3. Eight representatives of volunteers who actively participated in the Jalin Merapi network during the 2010 Merapi eruption. This group was interviewed regarding their voluntary participation in the Jalin Merapi network, the media selection of the Jalin Merapi network, the trustworthiness and effectiveness of the Jalin Merapi network, and the processes of the community participation in information provision, sharing, and verification that were

mediated by the Jalin Merapi network during the 2010 Merapi eruption (see Appendix A for the list of questions).

4. Eleven representatives of the Jalin Merapi audiences. This group was interviewed regarding the perceived trustworthiness of the Jalin Merapi network and the effectiveness of the Jalin Merapi network's media selection related to its compatibility with the community's media preference (see Appendix A for the list of questions).
5. Two officials of the Indonesian National Disaster Management Agency (BNPB). This group was interviewed regarding Indonesian policies of formal disaster management, coordination and information flow between BNPB and the regional agencies, the responsibilities of BNPB for information disseminating, and community engagement in official disaster communication.

   Unlike the other officials who were invited into the focus groups, the representatives of the BNPB were interviewed separately in Jakarta (the capital city of Indonesia) because of a lack of research resources. They were both located in Jakarta, which is approximately 550 kilometres away from the location of the focus groups, so it would have required additional funding to invite them to the focus groups in Sleman or Magelang. As previously discussed, the research participants of the study were categorized into two main groups based on the theoretical perspective: the local community members and the authorities. Although the representatives of BNPB were interviewed separately, their data was analyzed in the same category as the other authorities in the focus groups, regarding formal disaster management at national and regional levels.

3.5.1.1. Interview process and protocol

The quality of generated data and the interviewee's cooperation in a face-to-face interview are significantly influenced by the established relationship between the interviewer and the interviewee (Charmaz, 2006, Hesse-Biber, 2007). Hence, Bogdan and Biklen (2007), Creswell (2009), Lindlof and Taylor (2002), and Oakley (1981, cited in Ribbens (1989) suggest initially establishing non-hierarchical interactions in order to encourage trust, early rapport, reciprocity, and initiate the relationships between the interviewee and the interviewer. In comparison to the other research methods, the in-depth interview requires 'a more reciprocal style of interaction' (Ribbens, 1989, p. 580). Specifically, Charmaz (2006, p. 110) emphasizes that:

> Reciprocities are important and listening and being there are among them. Some researchers may command access on the basis of their authority and

> the prestige of their projects. Many other researchers cannot. Instead, we gain access through the trust that emerges through establishing on-going relationships and reciprocities. Ignoring such reciprocities not only weakens your chances of obtaining telling data but, moreover, dehumanizes your research participants – and yourself.

The non-hierarchical interactions and the reciprocity are particularly significant in responding to the possibility of unbalanced power between interviewer and interviewee. If the issue of unbalanced power is not addressed appropriately, it may interfere with the willingness of participants to be engaged and to provide a subjective understanding of the phenomenon studied (Charmaz, 2006, Hesse-Biber, 2007, Ribbens, 1989, Oakley, 1981).

In practice, Burgess (1984), Charmaz (2006), Lindlof and Taylor (2002), and Persaud (2010) emphasize that an interviewer needs to have the social skills to encourage trust in the initial relationship with the interviewee and be more sensitive to the interview's context. Particularly in a cross-cultural interview, Charmaz (2006), and Lindlof and Taylor (2002) emphasize that the interviewer should take account of the participants' local culture. Adapting myself (as the interviewer) to the interviewees' cultural context was one of my concerns because the interviewees and I did not share the same culture, regardless of the fact that we are Indonesian. The research participants' culture is Javanese unlike mine. Thus, I attempted to learn about Javanese culture in general and make the participants feel comfortable by using a friendly approach in a familiar environment.

I also dressed appropriately according to the anticipated dress code of the participants during the interviews. For example, I dressed very casually for the interviews with the community members, and in formal attire for the interviews with the officials. In addition to my attempts to be culturally sensitive, all interviews and focus groups were conducted in Bahasa Indonesia. I also sometimes used the Javanese language during the interviews. In Indonesia, people who are not close usually do not call each other by name, but by appellation. Thus, I called my participants by the appellation of *Mas* (brother), *Mbak* (sister), *Bapak* (Sir) and *Ibu* (Mam). The culturally-sensitive behavior and appearance resulted in a situation of equality in an interview, and furthermore were effective in building rapport between the the participants and me (Lindlof and Taylor, 2002).

Prior to each interview, I introduced myself, explaining who I was and my personal reasons for conducting the study, and engaged in 'ice-breaker' small talk with them. The small talk and the self-disclosures were attempts to encourage trust, build an early rapport and

discourage the participant's feeling of being treated solely as a data-providing object. As a result, the participants seemed to feel comfortable talking about themselves. Afterwards, I handed in the information sheet to the interviewee (see Appendix A), while verbally explaining the study purposes, the reason the participants had been contacted, and how the interviews would be conducted. The information sheet outlined the purposes of the research, the average length of time of an interview, the general theme of questions, the voluntary participation, the optional confidentiality, the future publication of the research, and my doctoral supervisor's contact for any possible inquiries in future, along with the approval of the University of Canterbury Human Ethics Committee.

While the participant was reading the information sheet, I once again offered them the opportunity to ask any questions or address any concerns regarding the research. The information provided in the information sheet and the repeated explanations of the research scope were aimed at ensuring the clarity of the research purposes for the interviewee (Patton, 2002) . This process is more likely to elicit cooperation from the participants so they provide accurate and relevant information voluntarily (Persaud, 2010, Ribbens, 1989). Besides, a clear statement of the research purpose should encourage rapport between the researcher and the participants (Lindlof and Taylor, 2002). Further, I verbally emphasized that there were no right and wrong responses, as the participants' views were the most important. When interviewees are assured that they will not face 'denial, contradiction, competition, or other harassment' from the interviewer, they will not feel intimidated and will speak more freely (Benney & Hughes, 1970, pp. 194-195). Again, I urged the participants to bring up questions or issues relevant to the topics that I might not know to ask.

After they had finished reading the information sheet, again, I confirmed their agreement in participating. When they stated their agreement, I requested them to sign the consent form (see Appendix C) and fill in a form to obtain their demographic information. The consent form basically outlined similar information as on the information sheet, confirming their agreement to participate voluntarily, their knowledge of data storage and my contact details, their request to remain confidential or not, and their right to withdraw from participating at any time. Owing to the available option of confidentiality, I provided two different consent forms. For those who chose to remain confidential, their identities would remain unpublished. Yet, none of the interviewees wanted to remain confidential. Thus, their identities would be revealed in any publication of the research. The identity of interviewees made public was

taken from the information provided in the demographic form, not the information that was initially provided by the referees as a third party.

I asked the participants' permission to record the interviews, and none of them expressed any objection to being recorded. To record the interviews, I took field notes and recorded the interviews using a digital audio recorder. The use of the recorder was to 'capture the interview more or less exactly as it was spoken' (Lindlof & Taylor, 2002, p. 187). Besides, it could free me up to be fully engaged in the interview without having to worry about losing the exact statement of the interviewees (Charmaz, 2006). In total, the duration of the audio recording of the 35 interviews was 31 hours and 19 minutes; this indicates that the average time of the interviews was approximately 53 minutes.

All interviews were maintained in a conversational tone, as I took a less directive and dominating role in asking questions (Charmaz, 2006, Lindlof and Taylor, 2002). I also encouraged the interviewees' interests by emphasizing the scope of the research at the community level. My arguments were most likely to be useful for community empowerment in performing trustworthy disaster communication. Consequently, the sense of equality and alignment somewhat eliminated the asymmetrical power roles of the interviewer and interviewee, and encouraged the sense of community stakeholder for the interviewees' interest (Lindlof and Taylor, 2002). More importantly, I kept reminding myself not to further probe for answers to those questions that might be sensitive to the participants' vulnerabilities and potentially recall their traumatic experiences of the 2010 Merapi eruption, as suggested by Charmaz (2006) regarding an interview with people who have experienced a crisis.

3.5.1.2. Locations of interviews

The in-depth interviews were carried out at five affected sub-districts in the areas surrounding the Merapi volcano. These were the Selo sub-district in the Boyolali district, the Dukun sub-district in the Magelang district, the Salam sub-district in the Magelang district, the Kemalang sub-district in the Klaten district, and the Cangkringan sub-district in the Sleman district. The selection of these particular sub-districts was based on the locations of the community radio stations involved in the Jalin Merapi network. However, in determining the venues and the schedules of interviews, I always asked the interviewees during the initial phone contact, as I did not know their preferences. The main consideration in asking the interviewees was to ensure their convenience and privacy (Lindlof and Taylor, 2002). In

practice, the interviews were conducted in the interviewees' residences, public spaces or their offices (including a radio station) in the research locations.

3.5.2. Focus group interviews

In conjunction with the in-depth interviews, data was also gathered in two focus group interviews. Unlike the in-depth interviews that mainly focused on disaster communication at the community level, the focus groups aimed at exploring the official disaster communication at the government level. Specifically, the open-ended questions of the focus groups were related to the official information flow of disaster communication between the involved government agencies and from the government agencies to the public, the content of the official disaster communication, the official database of disaster information, media usage in official disaster management, the accuracy and trustworthiness of community-based information from the government perspective, and community engagement in the existing formal disaster communication (see Appendix B for the list of questions). The main objective of conducting the focus groups was to identify any gaps between the institutional approach and the community's perspective (gained from the in-depth interviews) of trustworthy and participatory disaster communication.

There were some considerations in selecting focus groups as one of the data collection methods in the study. The first consideration was the ability of a focus group to produce cumulative data on the various views of participants, which results from the dynamic interaction between the participants through dialogue (Lindlof and Taylor, 2002, Kaehne and O'Connell, 2010, Cambridge and McCarthy, 2001, Barr et al., 2003). This particular ability is effective in understanding how the participants feel or think about the research subject (Morgan, 1998) and mirrors the paradigm of social constructionism adopted in this study. However, the emergent consensus view does not necessarily neglect individual opinions. Instead, the individuals' experiences, beliefs, and understanding jointly elaborate the consensus view, as described by Smithson (2008, p. 368) below:

> It enables research participants to discuss and develop ideas collectively, and articulate their ideas in their own terms, bringing forward their own priorities and perspectives.

In practice, a focus group is considered to be effective in gaining a cumulative perspective from the various government agencies involved in Indonesian formal disaster management.

Owing to the different authorities of the government agencies, consensus data is less likely to be accessible if they were interviewed separately. Moreover, interviewing more than one person at the same time is significantly beneficial for research time and resources savings (Smithson, 2008).

Additionally, the focus group can be considered as a relatively egalitarian method because it inevitably reduces the researcher's control over the interaction. Owing to the lack of intervention by the researcher, a focus group is likely to provide peer solidarity and validation as a non-threatening environment for discussion (Cambridge and McCarthy, 2001, Krueger and Casey, 2000, Wilkinson, 2004). Thus, this ability is very useful for people who may be uncomfortable with individual interviews, but happy to talk with their peers. However, as also raised by Smithson (2008), I realized that individual hesitation in speaking straightforwardly in front of their superior and the possibility of offending another institution were inevitable during the focus groups. As an attempt to mitigate the risk, the moderator of the focus groups verbally emphasised the freedom of speech, as the participants were free to share their opinions without having to worry about being criticized. Thus, all participants were asked to respect everybody's opinions.

In practice, two focus group interviews were held in the districts of Sleman and Magelang. Although some scholars argue that the ideal design of focus groups is achieving the point of theoretical saturation, which occurs somewhere between three and twelve focus groups, I decided to limit my focus groups to two groups owing to the lack of supporting research resources. Unlike the individual in-depth interview, organizing a focus group requires more financial support with regard to travel expenses, remuneration, and refreshment (Smithson, 2008). I could not conduct only one focus group, which would stand as a representative of the perspectives of authorities in the Mt. Merapi surrounding area, because of the possibly different policies of disaster management among the four districts. As the four districts in the surroundings of Mt. Merapi are administratively under two different provinces, two focus groups were conducted with a similar type of participants so the research could identify trends of perception by performing cross-group comparability (Smithson, 2008).

The district governments of Sleman and Magelang were selected purposely as the representatives of all district governments in the Mt. Merapi area, because those particular

districts had large numbers of casualties and refugees compared to other districts[13] during the 2010 Merapi eruption. The Sleman district was selected to represent formal disaster management in the Province of the Special Region of Yogyakarta; meanwhile, the Magelang district was selected to represent the formal disaster management in the Province of Central Java. I did not conduct focus group interviews in the districts of Klaten and Boyolali because they were more likely to have a similar mechanism of disaster management to the Magelang district as the three of them are administratively under the Province of Central Java.

Although the locations and the district governments of the focus groups were selected purposely, the selection of the invited agencies was conducted with snowball sampling based on the recommendation of the Regional Disaster Management Agency (BPBD). According to the Indonesian Law no. 24, the BPBD is the leading agency in formal disaster management at the district level. Therefore, I assumed that BPBD could provide a reliable recommendation on which regional agencies were involved in the formal disaster responses in the Mt. Merapi eruption. Prior to the focus groups, I visited the Sleman Disaster Management Agency and the Magelang Disaster Management Agency to ask for their recommendations on the appropriate agencies for the focus groups for this study. Following the regulation of the provinces as their higher level of governance, the Sleman district and the Magelang district have different policies on disaster management which led to the difference in involved agencies in responding to the Merapi eruption in each district. Consequently, I invited the different regional agencies to the focus group interviews in each district.

Regardless of the different agencies involved, the policies of disaster management of both district governments involve numerous agencies in their formal disaster responses. Again, owing to the limited research resources, I decided not to accommodate all involved agencies and limited the number of the invited agencies for each district government. In practice, obtaining the appropriate number of focus group participants can be challenging (Smithson, 2008), as various scholars present diverse arguments about the appropriate range of the number of participants. Without stating a specific number of participants, Brannen et al. (2002, cited in Smithson (2008) argue that having a small group can provide a sufficient space for active participation from each participant and for a detailed discussion. Similarly, having a big group is more likely to make the participants remain silent, because of the

[13] In the 2010 Merapi eruption, Sleman had 243 casualties and 26,774 refugees; Magelang had 52 casualties and 18,505 refugees; Klaten had 36 casualties and 4,321 refugees; Boyolali had 10 casualties and 672 refugees (BNPB, 2010).

possibly personal fear of speaking or embarrassment about talking about personal concerns in a big group (Smithson, 2008, Lindlof and Taylor, 2002, Barrett and Kirk, 2000) .

Therefore, I decided on the number of the invited agencies based on the suggestions of Lindlof and Taylor (2002, p. 182) and Smithson (2008). They restrict the number of focus group participants to between six and twelve; a focus group with fewer than six participants would lead to 'a less diverse range (and more rapid exhaustion) of useful comments'. Based on the recommendation of the Sleman Disaster Management Agency (BPBD) and the Magelang Disaster Management Agency (BPBD), eight agencies were invited to participate in each focus group. In responding to the recommended number, I assumed that eight participants (one representative official for each agency) would be the appropriate number of participants for each focus group, as it would not be too "crowded" but sufficient to explore diverse responses from the engaged officials.

Following the recommendations of the BPBDs, 16 invitation letters (see Appendix B for a representative sample of the letters) were sent to the intended government agencies in Sleman and Magelang (see Table 1). Each letter was addressed to each Head of the agencies to ask for his/her willingness to be a participant or, instead, to appoint an official as the representative of the agency. The letters also outlined the scope and the purposes of the study, and the planned location and time of the focus groups. Similarly to the snowball sampling in the in-depth interviews, the representative officials, who were the participants of the focus groups, were designated by the Heads of the invited agencies.

The Focus Group of the Sleman District Government	The Focus Group of the Magelang District Government
1. The Sleman Disaster Management Agency. 2. The Sleman Demographic and Civil Registration Agency. 3. The Geological Disaster Technology Research and Development Agency. 4. The Sleman Code and Telecommunication Sub-division. 5. The Head of the Cangkringan sub-district, as the most-affected sub-district in the 2010 Merapi eruption in the Sleman district. 6. The Kepuharjo village government, as the closest village to the Merapi peak in the Cangkringan sub-district. 7. The Sleman Transportation,	1. The Magelang Disaster Management Agency. 2. The Magelang Social, Labour, and Transmigration Agency. 3. The Magelang Health Agency. 4. The Magelang Regional Planning and Development Agency. 5. The Magelang Public Works, Energy, and Mineral Resources Agency. 6. The Dukun sub-district government, as the most-affected sub-district in the 2010 Merapi eruption in the Magelang district. 7. The Head of the Ngargomulyo village, as the closest village to the Merapi peak

Communication and Information Agency 8. The Center for the Serayu-Opak River Region	in the Dukun sub-district. 8. The Magelang Communication and Information Agency

Table 1. The invited government agencies in the districts of Sleman and Magelang

In practice, the focus group of the Sleman district governments was conducted on 19 June 2014, and that of the Magelang district governments was conducted on 19 July 2014. Seven appointed officials attended each focus group. In the Sleman focus group, the invited official of the Center for the Serayu-Opak River Region and the invited official of the Sleman Transportation, Communication and Information Agency which is responsible for official information sharing and coordination in the Sleman district did not show up. Similarly, the invited official of the Magelang Communication and Information Agency, which is responsible for official information sharing and coordination in the Magelang district, did not show up either.

3.5.2.1. Focus group process and protocol

Both focus groups were led by a moderator whom I personally selected based on her professional experiences. The decision to have a moderator was made based on consideration of their important role in encouraging participants to speak out and promoting a good group dynamic (Smithson, 2008, Lindlof and Taylor, 2002). Ideally, a moderator can bridge the potential gap in individual perspective, which may occur due to the heterogeneity of the participants (Morgan, 1998). Without a moderator, I was concerned I might be overwhelmed in maintaining my focus on the content of discussion, while simultaneously trying to maintain the group dynamic and observing the non-verbal communication of each participant. Therefore, sharing responsibility with the moderator was extremely useful for me in order to maintain my substantial focus. In practice, the moderator fully facilitated the interactions within the focus groups, and I was among the participants, but did not take part in the group interactions.

In contrast to the loose-template of the in-depth interviews, the focus groups followed a more structured protocol to build rapport because of the possibly heterogeneous perceptions of the participants (Lindlof and Taylor, 2002) . In practice, the focus groups started with a welcome and self-introduction of the moderator and me as the researcher. As in the interviews, the introduction was followed by an explanation of the research scope and distribution of the information sheets. While the participants were reading the information sheet, the moderator

verbally underlined the optional confidentiality and the voluntary participation. Later, she pointed out the audio recorder and the video recorder while explaining consideration of their usage. Finally, she offered the participants the opportunity to ask any questions or address any concerns regarding the study. All questions were answered subsequently. After all participants had completed their consent form, the moderator started the semi-structured discussion guided by a list of open-ended questions. Both focus groups lasted approximately two hours, with lunch at the end; the length of time was still in the ideal range of interview length (Lindlof and Taylor, 2002, Smithson, 2008).

3.5.2.2. Physical environment of the focus group interviews.

Unlike the interviews' venues that were recommended by the interviewees, I determined the locations of the focus groups to ensure that the places had a relaxed-friendly ambience, so the participants could feel comfortable in expressing their opinions. Following the suggestion of Lindlof and Taylor (2002, p. 182) for a 'neutral' location to accommodate the diversity of the participants, the focus groups were not held in a particular office of the participants. Instead, they were held in conference rooms of restaurants close to the participants' offices, so it could be convenient for them. I chose private and closed rooms with quiet ambience, so the participants could be distraction-free and their information remain confidential. Both rooms of the focus groups were large enough to fit everyone in, and had some comfortable chairs arranged in a rectangular shape. The moderator sat at the side of the table and I sat on the other side. I positioned myself on that particular side because the position gave me a wide view of the non-verbal communication of all participants. The ability to have an unimpeded observation of the participants is important because it may reveal any concealed data (Charmaz, 2006). Moreover, the layout provided an effective environment for a non-bureaucratic discussion.

A digital audio recorder was placed in the middle of the table, and a video recorder was set up next to me (see Figure 4). The reason for using an audio recorder in the focus groups was similar to those in the in-depth interviews. The audio recorder was useful to pick up some details of the participants' statements that I might have missed in my field notes. However, it might not be so helpful when several people talked at the same time and it would be difficult to identify the overlapping voices. Therefore, I added a video recorder to help me identify voices and to capture simultaneous non-verbal communication from different participants that I might have missed.

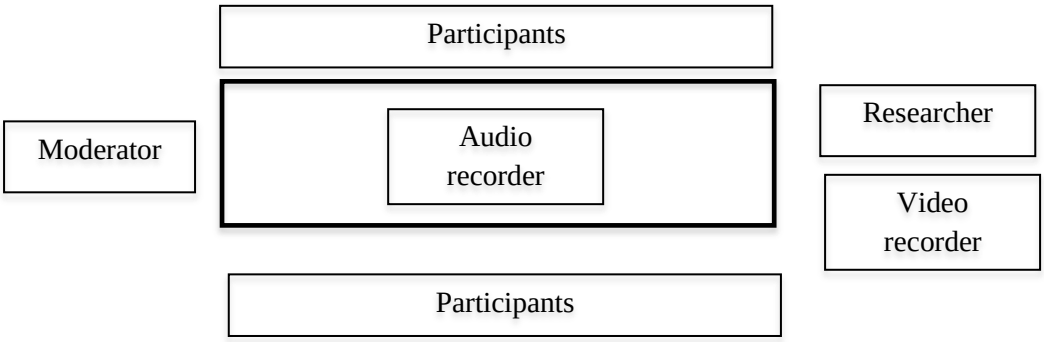


Figure 4. The layout of the focus group interviews.

3.5.3. Transcribing

The length of the audio recordings of the interviews and the focus groups was approximately 35 hours in total. Therefore, I hired a transcriber to help me with the transcribing workload. The transcriber was responsible for transcribing the audio recordings in Bahasa Indonesia and sending me the initial transcripts. Further, I read the initial transcripts while listening to the recording, so I could identify and add anything that had been missed by the transcriber. Moreover, I made notes of the non-verbal signals recorded on the tape, such as a cough, a laugh, a sigh, a pause, a silence, an outside noise, a telephone ring, or any interruption. The non-verbal signals might implicitly support or contradict what the participants stated, or indicate something about what the participants might have meant. Thus, acknowledging the signals can significantly strengthen my interpretation of the possibly real meaning of the interviewees' statements or actions (Charmaz, 2006, Lindlof and Taylor, 2002). Furthermore, I translated the transcripts into English because both the interviews and the focus groups were conducted in Bahasa Indonesia. Consequently, the processes of transcribing and translation were time-consuming and resulted in 693 pages of typed transcripts.

3.6. Data Analysis

Charmaz (2006) outlines that the grounded theory methodology stipulates analysis through coding, constant comparative analysis, and memo writing in order to identify tentative categories, define gaps, and delineate relationships between categories. In a grounded theory study, data analysis is conducted simultaneously with data collection in a zigzag process; it is back and forth between data collection and analysis: gathering data, analyzing the data, data

becoming codes, codes becoming suggestive categories, finding a possible gap, gathering more data, analyzing more data, and so forth (Charmaz, 2006, Hansen, 2009, Salkind, 2010, Miller and Salkind, 2002, Egan, 2002).

In general, I started my data analysis by systematically coding the empirical key themes and developing them into conceptual categories. Later, I identified the patterns of, and the relationships between the developed conceptual categories, to generate a theoretical framework. Each analytical stage of the data analysis involved constant comparative analysis to name the category and compare the emerging category against another, and memo writing to define relationships between the data categories, specify their properties, and identify any possible gaps in order for a theory to emerge (Corbin and Strauss, 2008, Glaser, 1978, Charmaz, 2006, Hansen, 2009, Miller and Salkind, 2002, Miles and Huberman, 1994). The result of the data analysis is a theoretical framework describing the positive relationship between the social capital embedded in the local culture, the tie strength of the local social network of an affected community, trust, and community participation in community-based disaster communication. The framework also details community participation in providing, verifying, and sharing locally-relevant disaster information through media multiplexity.

3.6.1. Data coding

According to Glaser (1992), coding is a process of data conceptualization by constant comparison of data to enable categories to emerge. Specifically, in constructivist grounded theory, Charmaz (2006) defines coding as a researcher's attempt to interpret the implicit meaning of the participants' empirical views and actions, and describe the interpretation with his/her own language and perspective. Thus, coding is constructed from the researcher's perspective and is useful for 'sorting, synthesizing, integrating, and organizing a large amount of data' (Charmaz, 2006, p. 46).

In regard to the procedural stages of coding, all grounded theory scholars seem to agree that the coding process starts with open/ initial coding and ends with focused/selective coding. However, scholars seem to be divided when it comes to axial coding. Hansen (2009), Polit and Beck (2010), Miller and Salkind (2002), Strauss (1987), and Strauss and Corbin (1998) define axial coding as the processes of defining a core category, connecting it to the other categories, and specifying the properties of a category. Thus, they argue that grounded theorists need to conduct axial coding in between the open/initial coding and the

selective/focused coding. Furthermore, Strauss and Corbin (1998, p. 125) conclude that the important roles of axial coding lie in providing answers to the questions of 'when, where, why, who, how, and with what consequences', and integrating the segmented data, which is previously fractured in the initial coding, into a coherent framework.

On the other hand, Charmaz (2006), Glaser (1978) and Urquhart (2007) argue that the axial coding of Strauss actually overlaps with an analytical part of focused/selective coding. Contradicting the role of axial coding in reuniting the fragmented data, Glaser (1978) specifically argues that the theoretical coding will eventually compile the fragmented data back together; so axial coding is not necessary. He further argues that the coding is an attempt to force data to fit the emerging theory, rather than allowing a conceptual category to emerge organically from the data (Levers, 2013). Moreover, Charmaz (2006) claims that axial coding is impractical and can limit researchers' interpretation of their empirical findings, because it encourages a pre-set framework for the data.

Owing to the adoption of the constructivist grounded theory of Charmaz, the coding process in this study is mainly divided into two stages, which are the open/initial coding and the selective/focused coding. I did not necessarily eliminate the process of the axial coding; albeit, I take sides with Charmaz, Glaser and Urquhart regarding Strauss's definition of axial coding in developing the conceptual categories, and identifying the properties of a category and the relationships between categories as parts of the focused/selective coding. Besides, regarding the distinguished process of coding, Strauss (1987) and Glaser (2001) acknowledge that as long as the researcher maintains his/her main focus of the study, the sequential steps of coding can be altered in many ways based on the unique details of the study.

3.6.1.1. Open/ Initial Coding

The data analysis of this study started with open coding by exploring, identifying, and revealing the theoretical opportunities emerging from the data (Corbin and Strauss, 2008, Glaser, 1992). Open coding is also referred to as initial coding by Charmaz (2006). In practice, my initial coding was fully conducted on the transcripts of the interview and focus group recordings. This was can provide a deeper level of understanding of the studied phenomenon in comparison to coding from and across field notes (Charmaz, 2006). Since each group of research participants had different questions in their interviews, my coding system follows a single-layered design based on the groups of research participants: the

volunteers of the community radio stations and the Jalin Merapi network, the Jalin Merapi audiences, the Combine, and the authorities.

As suggested by Seidman (2013), I started my initial coding by separately interpreting the transcripts of each category of research participant. Specifically, I segmented the data into themes by making a judgement of what was significant in the transcripts. After identifying themes in my data, I coded the themes by attributing descriptive and concise labels of process or action[14] (Charmaz, 2006, Hansen, 2009, Glaser, 1978, Miles and Huberman, 1994). In total, I generated 133 codes from the transcripts of the interviews and the focus groups (see Table 2). Following the suggestions of Charmaz (2006), Glaser (1978), and Seidman (2013), the emergent codes remain short and tentatively open to any changes for the theoretical development.

	Codes
The Jalin Merapi audiences (21 codes)	voluntary, trustworthiness, reliable information source, general response level, response level of the community, response level of local government, media preference, mobile phone, mass media, traditional media, radio communication, internet and social media, community radio station, verifying information, information accuracy, sharing and providing information, cultural considerations, information flow, information demands, information accessibility, effectiveness, continuity.
Volunteers of community radio stations (28 codes)	characteristics of community radio stations, programs of community radio stations, audiences of community radio stations, responsibilities of community radio stations in a disaster, involvement in community-based information, mediator of information providing and sharing, responsibilities of community radio stations in community-based information, community-based information mechanisms, information demands, sharing and providing information, media selection, mobile phone, two way radio, weaknesses of two way radio, social media, mass media, traditional media, type of information, verifying information, reliable information source, information accuracy, coordination with and between the local government and the communities, coordination between the government and the community radio stations, coordination with the government within the community-based information, social networks of the broadcasters, disaster response level of the community, information accessibility, obstacles of community radio stations in information sharing.
Combined Resources Institution (31 codes)	the general social aspects of the community, information accessibility, response level of the community, development of a community-based information network, challenges, establishment process, purposes, involved parties, supportive infrastructure, trustworthiness of community-based

[14] Charmaz (2006) specifically suggests using gerunds for coding, because they can help the researcher to see sequences and make conceptual connections. Consequently, they can foster the theory construction.

	information networks, formal disaster management, coordination with the government in the community-based information network, information accuracy, information demands, providing information by the communities, sharing information, type of information, verifying information, local communities' acceptance, local communication behaviours, media usage, website, audio streaming, community radio station, Google docs as bank data, two way radio, SMS gateway, social media, Twitter, Facebook, mechanisms of voluntary participation.
Authorities (19 codes)	community-based information, two way radio usage in the community, community radio station usage in the community, internet-based media usage in the community, mobile phone usage in the community, traditional media usage in the community, coordination between government agencies, coordination between local government and communities, data management, information flow in formal disaster management, verifying information, media usage in formal disaster management, mobile phone usage in government, two way radio usage in government, traditional media usage in government, internet-based media usage in government, disaster response level, SOP and regulation, type of information.
Volunteers of the Jalin Merapi network (34 codes)	response level, voluntary participation, reason for participation, participation requirements, form of participation, field post volunteers, main post volunteers, any location volunteers, cultural considerations, coordination between volunteers, challenges of participation, aid donations, verifying information, sharing and providing information, types of information, media usage, SMS, mass media, website, Twitter, Google Docs, Facebook, two way radio, information source, information demand, information accessibility, information accuracy, community-based information network, mechanism of information flow, trustworthiness, practicality of a disaster response, effectiveness, involvement of a community radio station, coordination with local government.

Table 2. The initial coding of the five groups of research participants.

By conducting the initial coding, I simultaneously organized and summarized various aspects of data, and described the detailed patterns within the data (Charmaz, 2006, Braun and Clarke, 2006). The emergent codes subsequently suggested the development of early analytical concepts/categories and their properties/subcategories, and the patterns of relationships between the conceptual categories in the focused/selective coding (Charmaz, 2006, Hansen, 2009, Miller and Salkind, 2002, Stern and Porr, 2011).

3.6.1.2. Focused/selective coding

After the open/initial coding, data analysis continues with the focused/selective coding, in which the researcher incisively organizes and clusters the emergent codes into categories (Birks and Mills, 2011, Charmaz, 2003, Charmaz, 2006, Hansen, 2009). Because this study has multiple units of analysis, I analyzed the specific pattern of categories in each group of

participants before summarizing the patterns into a generalized pattern (Hansen, 2009). In each group of participants, I conducted a constant comparative analysis by repetitively comparing and contrasting the emergent codes against one another, based on their thematic similarities and differences (Glaser & Strauss, 1967, cited in Charmaz, 2006, Stern and Porr, 2011). Simultaneously, I conducted memo writing to develop ideas about how the random codes could be related to one another (Neuman, 1997, Glaser, 1978), and how they could account for the properties that can analytically define a category (Charmaz, 2006). As a result, some initial codes could be inductively raised as categories, which have a higher level of abstractness compared to the initial codes (Creswell, 2009). Subsequently, the initial codes with a similar theme were grouped under a higher level of category/concept (Corbin and Strauss, 2008, Miles and Huberman, 1994).

In the initial process of the focused/selective coding, I classified the 21 initial codes of the group of the Jalin Merapi audiences into four categories and 17 sub-categories/ properties, as shown in the diagram below.

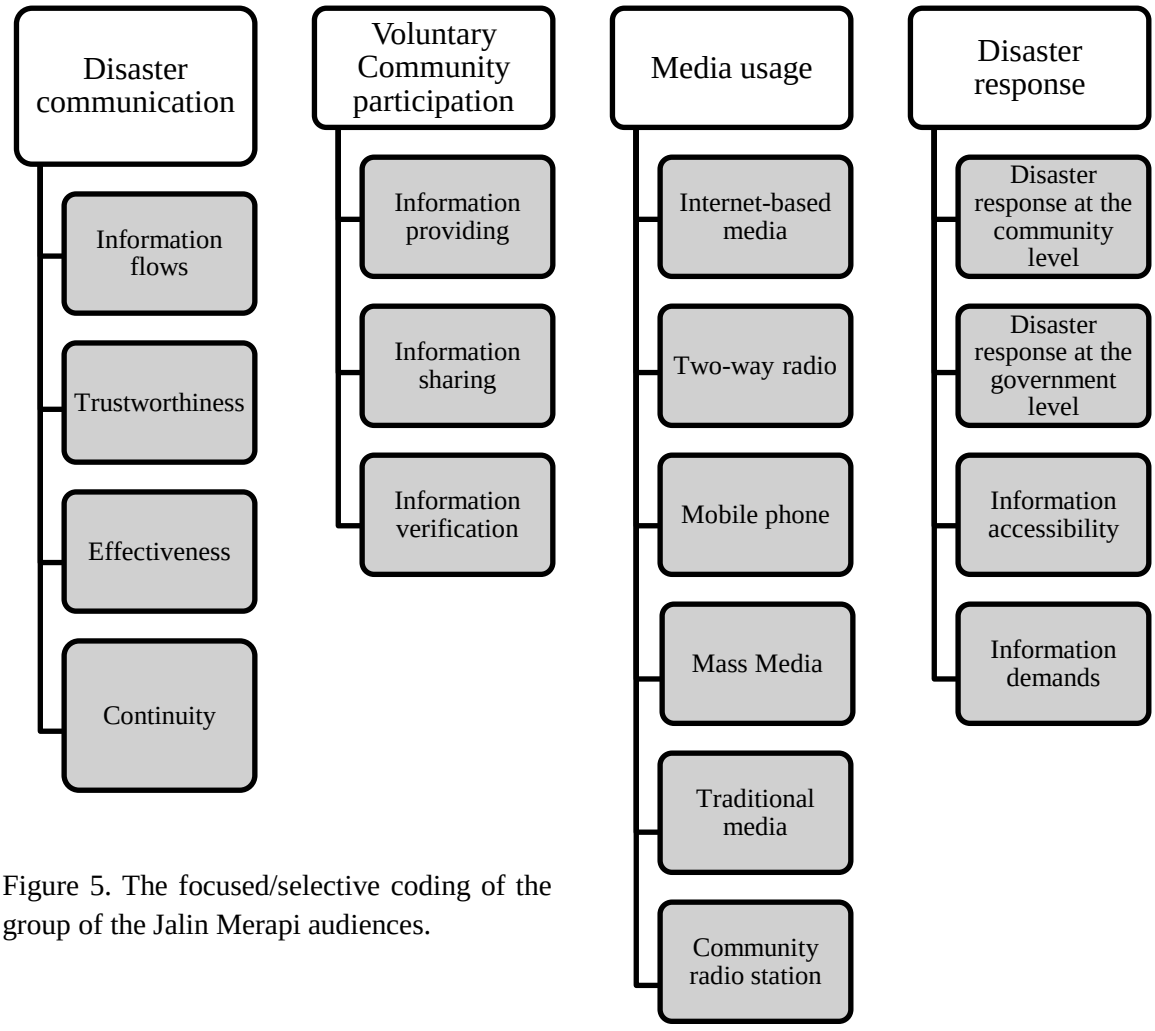


Figure 5. The focused/selective coding of the group of the Jalin Merapi audiences.

I classified the 28 initial codes of the group of the volunteers of community radio stations into five categories and 19 sub-categories/properties, as shown in the diagram below.

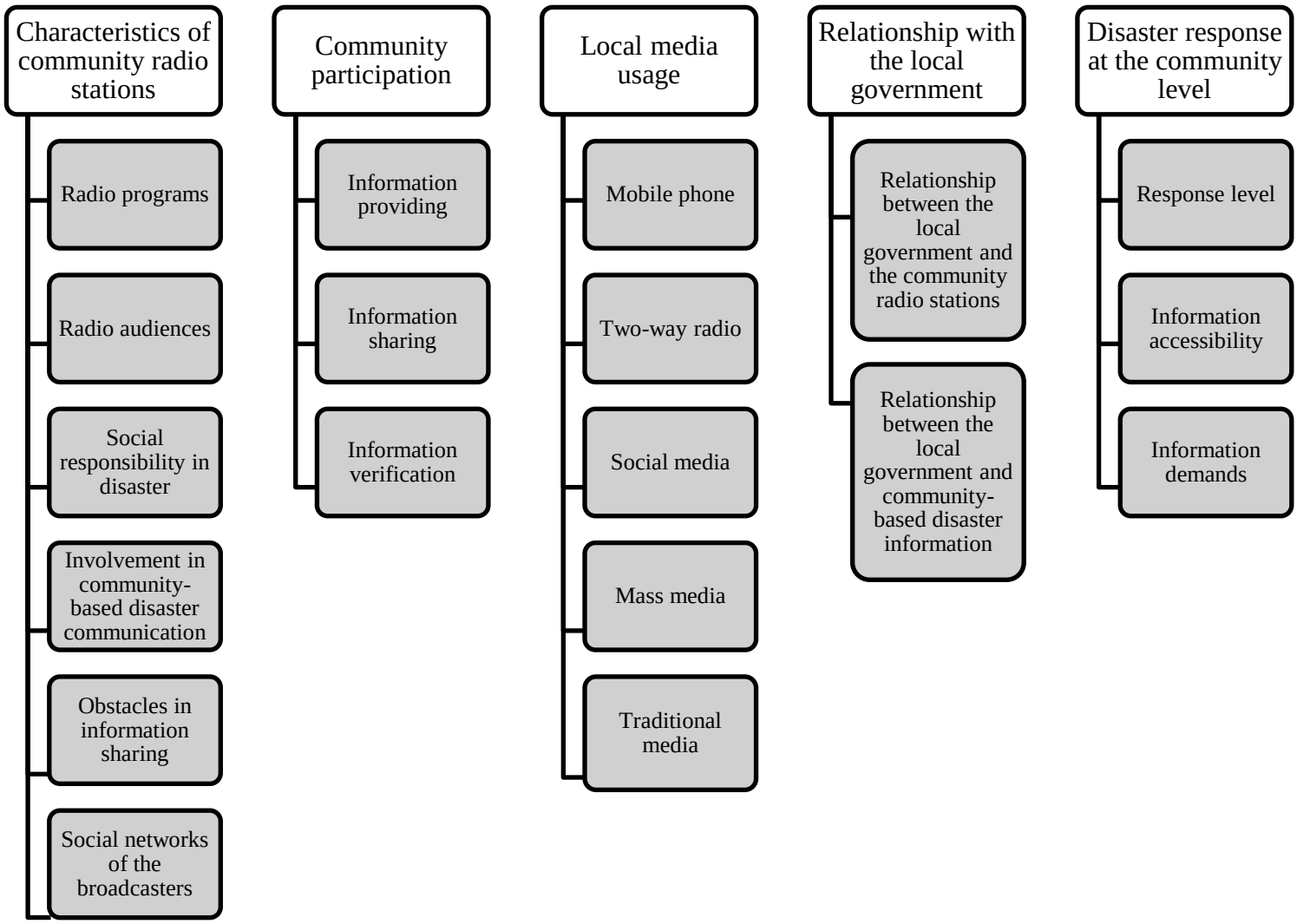


Figure 6. The focused/selective coding of the group of volunteers of community radio stations.

I classified the 31 initial codes of the group of the Combine Resources Institution into five categories and 20 sub-categories/properties, as shown in the diagram below.

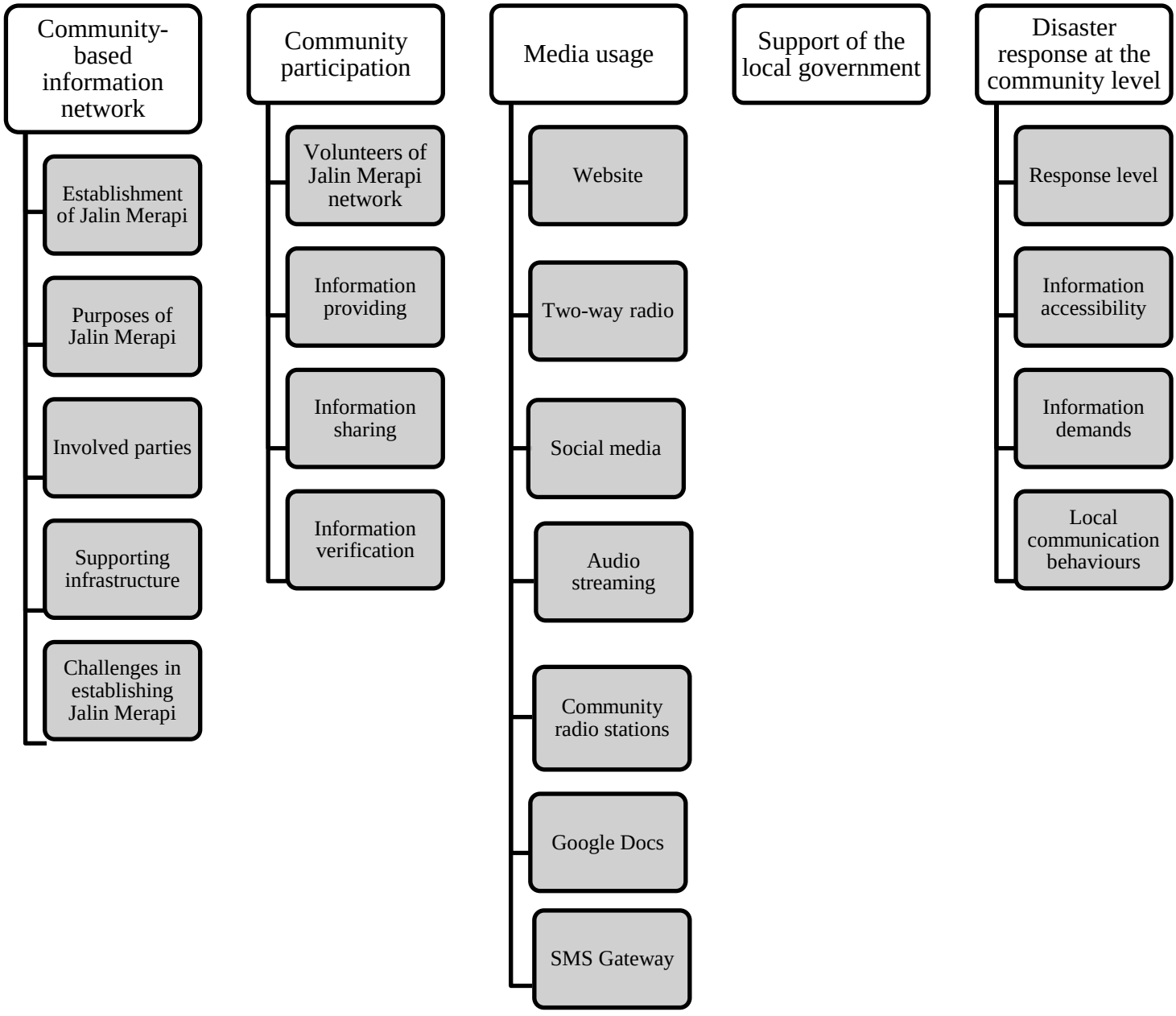


Figure 7. The focused/selective coding of the group of Combine Resource Institution.

I classified the 19 initial codes of the group of the authorities into four categories and 14 sub-categories/properties, as shown in the diagram below.

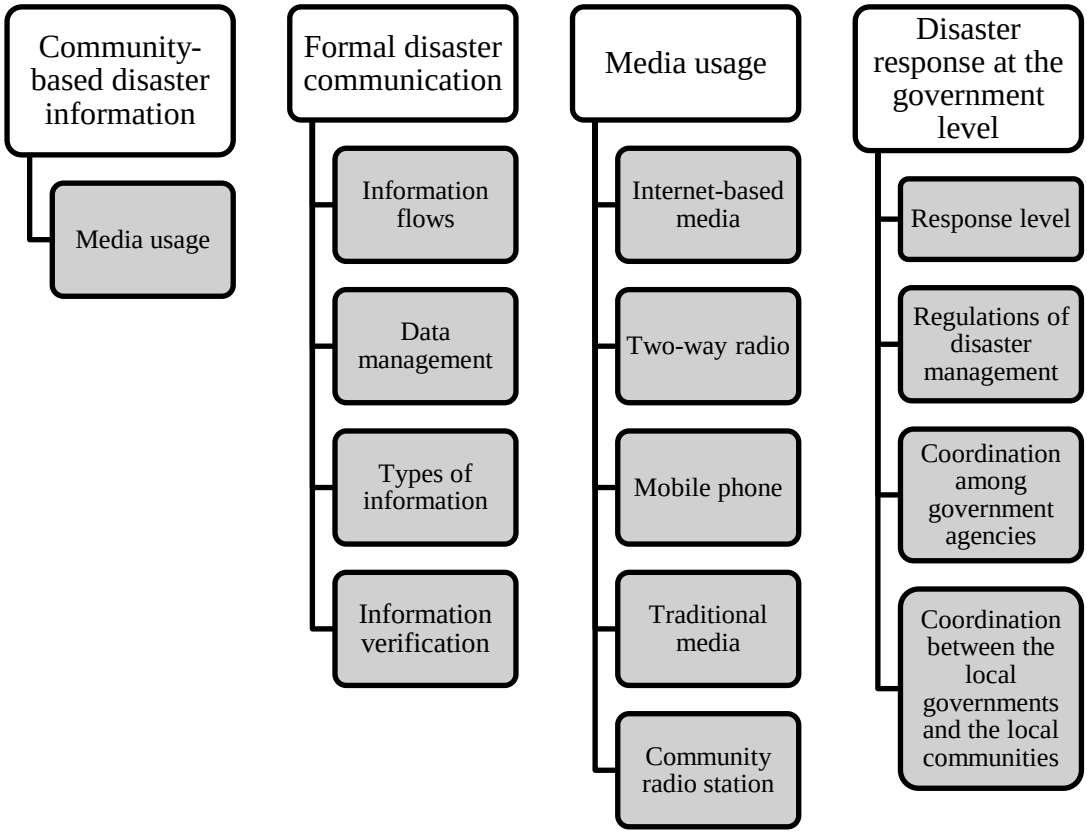


Figure 8. The focused/selective coding of the group of authorities.

I classified the 34 codes of the group of the volunteers of the Jalin Merapi network into four categories and 21 sub-categories/properties, as shown in the diagram below.

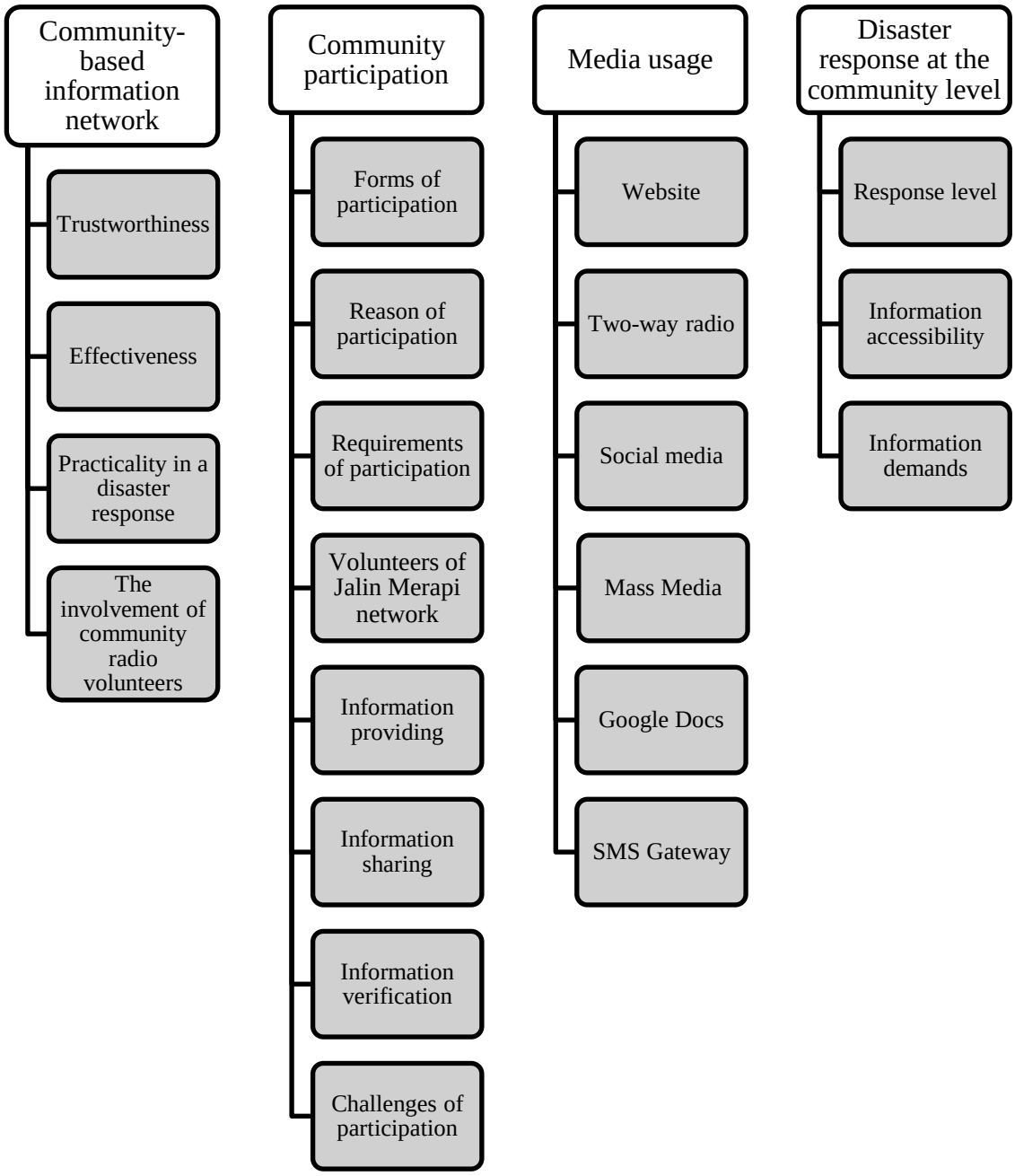


Figure 9. The focused/selective coding of the group of volunteers of the Jalin Merapi network.

After identifying the emergent conceptual categories in each group of participants, I conducted a cross-unit comparative analysis between the emergent categories of the five groups of the research participants to 'find what patterns are consistent and under what conditions other patterns are apparent' (Charmaz, 2006, p. 59; Putney, 2010). By

simultaneously conducting memo writing, I manually compared the emergent categories with the other categories to sharpen their distinctions, identify superiority, and interpret how they relate to one another (see Figure 10). By doing so, any possible gap in the emergent categories is more likely to be identified (Charmaz, 2006). Subsequently, the categories that significantly represented the most meaningful data were analytically treated as the major conceptual categories/concepts in the on-going theory development (Charmaz, 2006, Glaser, 1978, Glaser and Strauss, 1967). Consequently, the less discussed codes were disqualified (Charmaz, 2003).

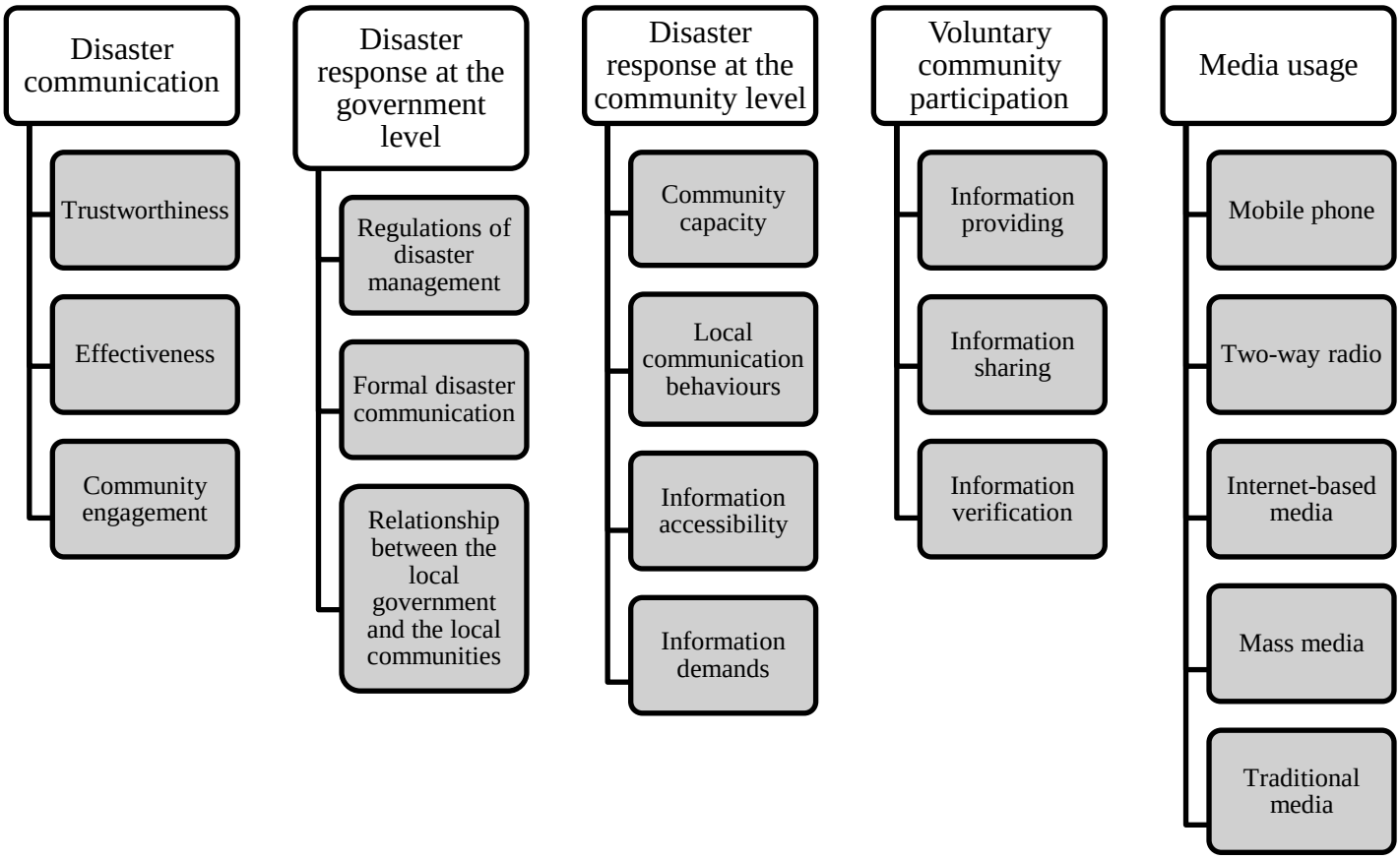


Figure 10. The focused/selective coding of the five group of research participants.

The process of categorizing the emergent codes with constant comparative analysis and memo writing continued to run until I reached the point of theoretical saturation. Although there is no consensus parameter to identify when the point of theoretical saturation is truly achieved (Holton, 2007), I adopted the definitions of Charmaz (2006), Glaser (2001), and Hansen (2009) that describe theoretical saturation as the emergence of a valid and reliable pattern of categories. Specifically, it is the point when the researcher faces a saturation of

categories; there is no new theoretical insight or a new emergent property. In practice, it was the point when I began to obtain similar findings to those already found from different participants (Marshall and Rossman, 2011, Morse, 1995). In other words, the theoretical saturation also can be observed with the repetitive subsequent conceptual categories which emerged from the different groups of research participants (Suddaby, 2006, Bowen, 2008). Consequently, the theoretical saturation also indicates the termination of theoretical sampling in the on-going data collection (Hansen, 2009).

As the final process of focused/selective coding, I hypothetically connected the emergent categories to the major category(ies) and elaborated the relationships of categories as an integrated conceptual pattern (Birks and Mills, 2011, Glaser, 1978) (see Figure 11). Specifically, Charmaz (2006, p. 63) outlines that researchers need to:

> [C]larify the general context and specific conditions in which a particular phenomenon is evident, specify the conditions under which it changes and to outline its consequences, learn its temporal and structural orderings and discover participants' strategies for dealing with them.

In connecting the conceptual categories to the major/core category(ies), Glaser (1978) offers the Six C as the coding families: causes, contexts, contingencies, consequences, covariances and conditions. In a similar fashion, (Strauss and Corbin, 1998) and Miller and Salkind (2002) offer four types of relationships between categories: (1) conditions, as the categories that establish the core category(ies); (2) actions/interactions/strategies, as the categories that represent the participants' routine actions or strategies in responding to the core category(ies); (3) intervening and contextual categories, as the categories that influence the categories of actions or strategies; and (4) consequences, as the categories that result from the categories of actions or strategies. Although these coding families can suggest the relationships between the conceptual categories, I, as suggested by Charmaz (2006), did not necessarily accept the coding families as a strict guidance to define all connections between the emergent categories in my data. As this study focuses on a complex social phenomenon, the suggested coding families may overlap or not cover all possible connections between the conceptual categories.

Finally, I compared and integrated my memos to develop a theoretical insight into how the conceptual connections between categories in my data can be elaborated into an interpretative theoretical understanding of trustworthy and participatory community-based disaster

communication, and how the emergent framework is relevant to closing gaps in the existing studies (Strauss and Corbin, 1994, Hansen, 2009, Strauss, 1987, Miller and Salkind, 2002, Charmaz, 2006, Glaser, 1978). This was when I began to frame my conceptual analysis into a theoretical statement (Charmaz, 2006). In practice, the emergent conceptual categories of my data were contextualized and triangulated within the existing literature on disaster management, disaster communication and social capital to corroborate the significance of trustworthy and participatory community-based disaster communication in disaster response (see Figure 12). The detailed analysis of this stage will be discussed further in the following chapters.

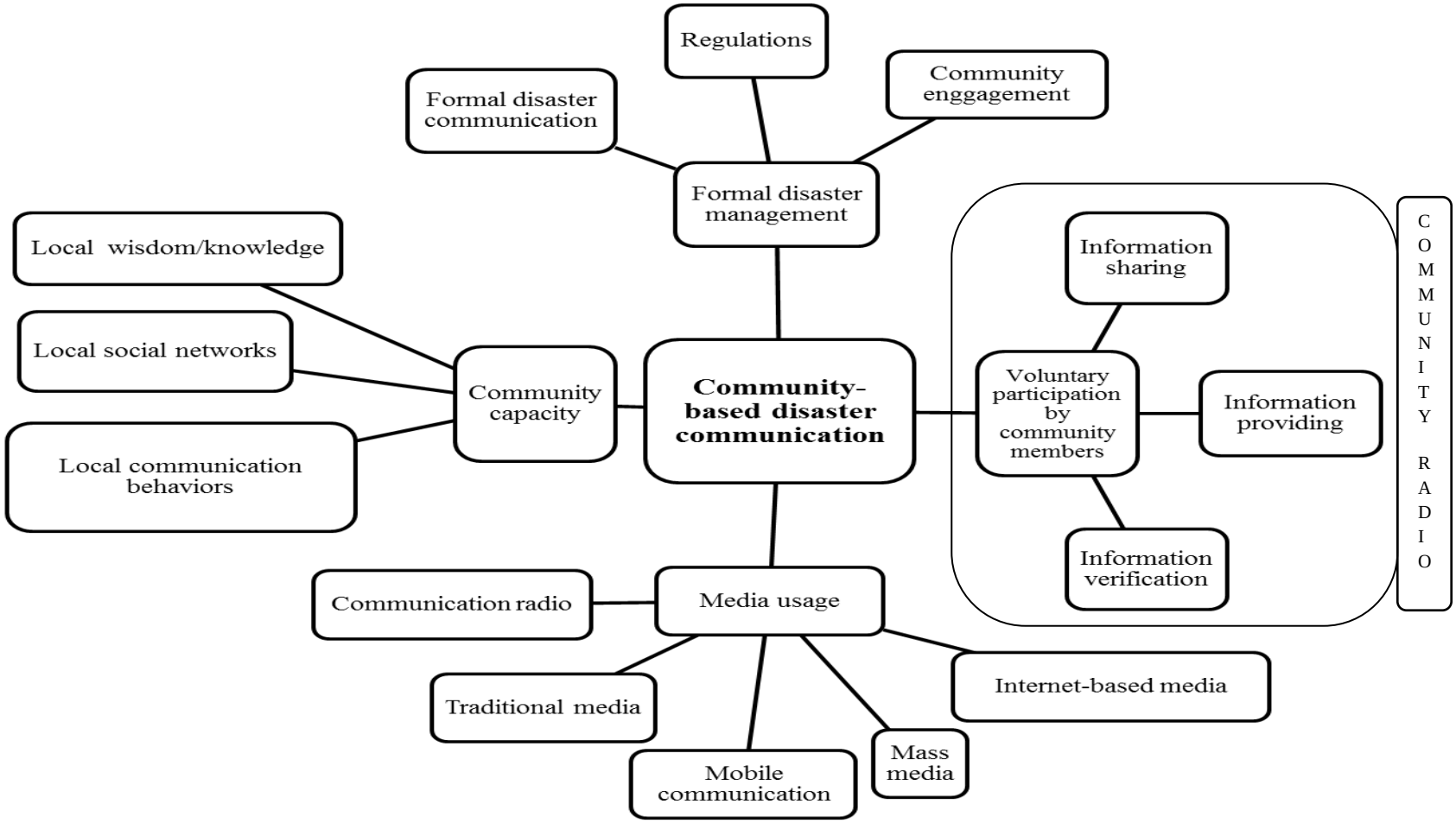


Figure 11. The integrated conceptual pattern of categories.

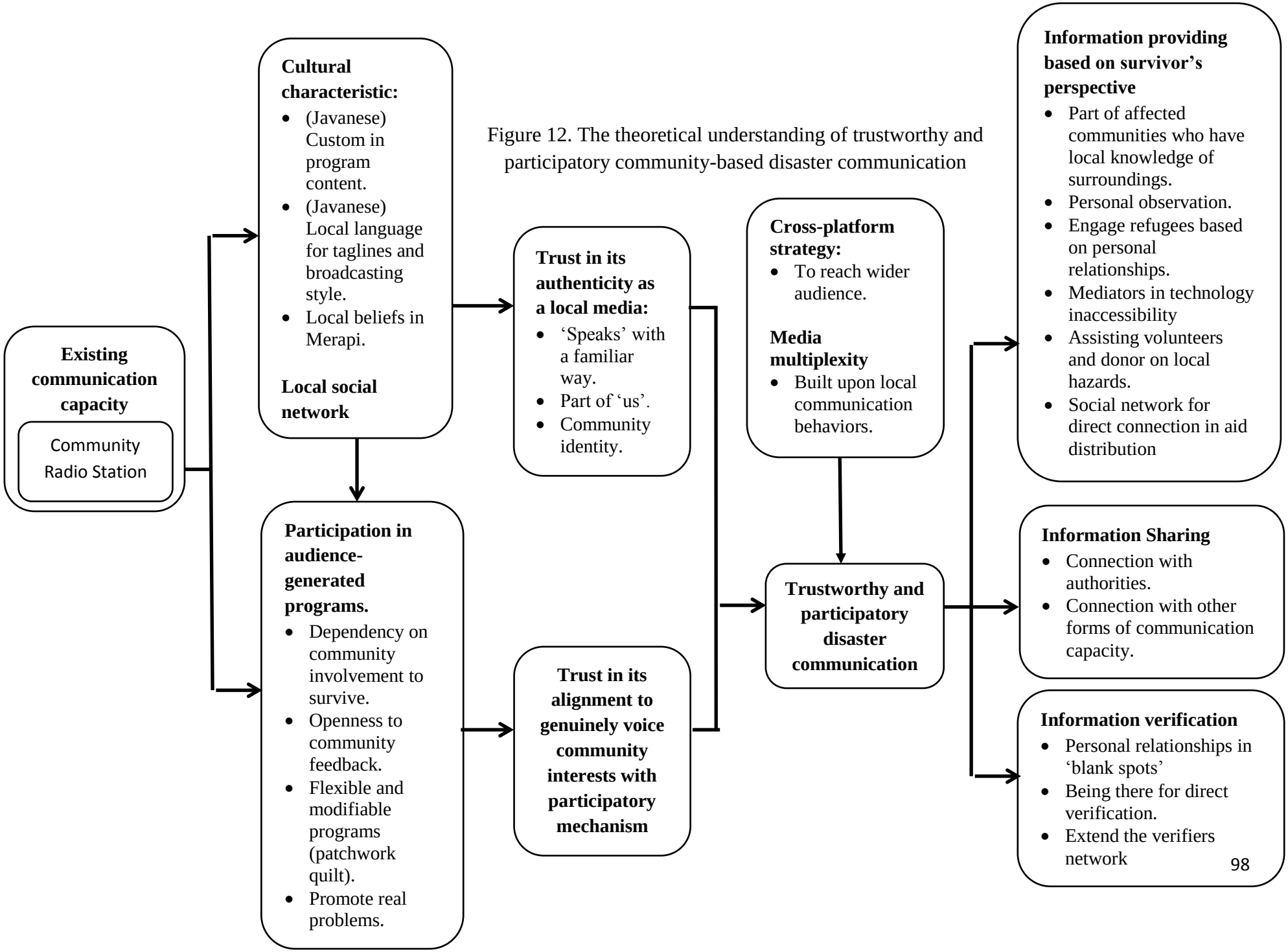


Figure 12. The theoretical understanding of trustworthy and participatory community-based disaster communication

3.7. Ethical Considerations

In addition to the responsibility for presenting rigorous research findings, a researcher is obligated to protect the basic human rights of the participants and not to cause harm to them (Bogdan and Biklen, 2007, Miles and Huberman, 1994, Persaud, 2010). In particular, Patton (2002) underlines that the method of in-depth interview faces more ethical challenges than other research methods, because it 'opens what is inside people' so it is more likely to be intrusive and encourage 'greater reactivity'. Therefore, I acknowledged some ethical challenges in the study, particularly regarding confidentiality, data storage, and any required research permits.

As previously discussed, all participants were offered optional confidentiality. Regardless of the effectiveness in gaining an agreement from the potential participants, I acknowledged that the snowball sampling I used may be in contradiction to my ethical obligation to protect the identities of my research participants. As snowball sampling requires an interviewee to recommend another interviewee, it means that the identity of the potential interviewee had been revealed even before I gained his consent to participate. Similarly, as I mentioned the referee to the potential interviewee in my initial contacts, it means that they obviously were aware that the referees had participated in my research. Although the snowball sampling is unlikely to respect the privacy of research participants, the consents of 48 participants to be neither anonymous nor confidential made the contradiction less problematic; thus, they would be identified publicly in this study. Only one participant of a focus group raised her concern about being anonymous and suggested she might be identified by her agency. This I addressed by reassuring her that her identity would be protected and not made public. However, despite the attempt to protect the confidentiality of the focus group participants, I still cannot fully guarantee that other participants would not discuss her identity afterwards (Smithson, 2008). More importantly, all participants were treated respectfully and professionally, no matter what their decisions of confidentiality.

Regarding the data storage, all data were securely stored on a password-protected computer in a locked office in the Department of Media and Communication, University of Canterbury. The raw data of audio recordings were previously accessible to the transcriber. In order to protect the confidentiality of the research participant, the transcriber had signed a confidentiality agreement confirming that the audio files would be deleted after transcribing, as well as the transcript files, and that the personal information from the confidential

participants remains strictly confidential. Starting from the process of data analysis, henceforth, the data have been accessible only to my doctoral supervisors. The raw data will be destroyed after 10 years.

As an assurance of the ethical rights of research participants and my ethical integrity, approval from the Human Ethics Committee of the University of Canterbury had been granted prior to data collection. Moreover, I gained the required research permits from the Indonesian governments for the data collection of Indonesia. Because the research was located in two different provinces, I initially had to gain a research permit from the Indonesian Ministry of Home Affairs, as the authority holder for domestic research permits at the central government level (see Appendix D). Afterward, I delivered the research permit as a recommendation to the provincial government of Central Java and the provincial government of the Special Region of Yogyakarta. Each provincial government issued a research permit for me (see Appendix D). Because the research focuses on the disaster communication at the community level and at the district level, the research permit of the provincial government of Central Java was delivered further as a recommendation to the district government of Klaten, Boyolali, and Magelang. Likewise, the research permit of the provincial government of the Special Region of Yogyakarta was delivered further as a recommendation to the district government of Sleman. Finally, I started conducting the study after the four district governments of Sleman, Klaten, Boyolali, and Magelang granted research permits for me (see Appendix D).

3.8. Conclusion

The study has been conducted based on constructivist and interpretative paradigms as the grounding logic for the selection of the qualitative methodology in this study. Specifically, I utilized a qualitative case study of the Jalin Merapi network in the 2010 Merapi eruption in order to gain an in-depth understanding of trustworthy and participatory community-based disaster communication. Additionally, I adopted constructivist grounded theory methodology by emphasizing that the construction of a theoretical understanding of the studied phenomenon does not solely refer to the interpretation of the research participants, but also the interpretation of the researcher (Charmaz, 2006).

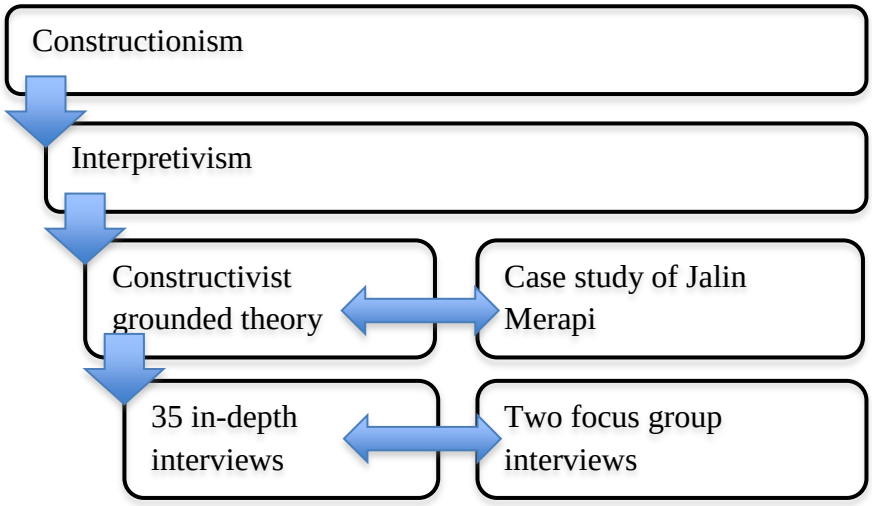


Figure 13. The research methodology

In gathering data, I conducted 35 in-depth semi-structured interviews and two focus groups to gather data from the local community living on the Mt. Merapi slopes and the local governments. Further, adopting the grounded theory methodology, I analyzed the data by conducting coding, constant comparative analysis, and memo writing in order to construct a theoretical framework that describes patterns and relationships between concepts of trustworthy and participatory community-based disaster communication in the phase of disaster response.

Chapter 4

Perceived trustworthiness and effectiveness of official disaster management

Experiencing the 2004 Indian Ocean tsunami became the critical point defining the inadequacy of formal Indonesian disaster management. Consequently, Indonesia updated its disaster management law in 2007 and released a series of regulations accordingly. As a result, according to the International Federation of Red Cross and Red Crescent Societies, Indonesia has 'one of the most comprehensive legal frameworks for disaster management and response in the world' (2015, p. 80). However, the legal comprehensiveness does not necessarily guarantee an absolutely successful disaster response in practice. Unlike the robust legal frameworks, formal disaster communication seems not to be prioritized as an important factor determining the effectiveness of a formal disaster response by the authorities in Indonesia. Therefore, taking the case study of the 2010 Merapi eruption, as one of the national disasters in Indonesia, this chapter emphasizes the importance of trustworthy formal disaster communication in facilitating an effective disaster response.

The formal disaster management of Mt. Merapi is a suitable case study to closely investigate the interaction between an at-risk community and authorities, particularly regarding trustworthy formal disaster communication. The tension between the local communities living on the slopes of Mt. Merapi and the local government has been recognized by numerous scholars (for example, Donovan et al, 2012; Dove, 2008; Lavigne et al., 2008; Schlehe, 1996; Triyoga, 1991; and Troll et al., 2015). Donovan et al. (2012) and Troll et al. (2015) explicitly identify the tension as a form of undermining trust in the local governments in the Mt. Merapi surroundings, which has led to the communities' reluctance to follow evacuation instructions and the government's program of disaster management.

The lack of trust in local government by those living in the Mt. Merapi surroundings existed long before the 2010 eruption. In 1977, Triyoga (1991) identified the tendency for undermined trust; he found that only 4% of the surveyed Merapi people trusted the government when an eruption occured. As previously mentioned in the introduction, the local community has been repeatedly unresponsive, or even resistant, to the official evacuation orders because of the incompatibility between the government approach in determining when the at-risk community has to evacuate and local cultural beliefs and economic vulnerability.

However, lack of trust in the local government has not only been influenced by the cultural beliefs of the local community, but also by the negative experiences with the local government prior to the 2010 eruption. Specifically, Donovan et al. (2012), Triyoga (1991), and Troll et al. (2015) identify that trust in local government was also undermined by the community's former experience when the local government in 1968 resettled 115 families permanently from their homes and made money by selling their land. As a result, in the 1978 eruption, the affected community refused to be resettled by the local government, which responded by abandoning the community; the authorities issued the policy of simply 'erasing' the village from the official government maps, as the easy solution to the community's refusal (Dove, 2008, p. 333). Again, in the 1994 eruption, the affected community refused to be resettled by the local government because they questioned the government's motives (Schlehe, 1996). The negative disaster experiences may have led to negative evaluation and lower trust in the authorities (Nicholls and Picou, 2013, Reinhardt, 2015), and, further, to individuals' disengagement from the official system (Giddens, 1990).

In a similar fashion, the interviewed community members, including the community radio volunteers, constantly described a low level of perceived effectiveness and generalized trust in local governments regarding formal disaster response, because of their misfortunes in the past Mt. Merapi eruptions. Specifically, they have regarded the formal efforts of the local governments to reduce the Mt. Merapi risk as inappropriate and not beneficial for the local community. Unfortunately, the tension between the authorities and the local communities frequently led to casualties because the government could not force the community members to evacuate when an eruption occurred. As an interviewed community member explained: 'Although the local government is responsible for facilitating evacuation process, the decision to evacuate totally depends on the communities themselves completely' (Setiawan, personal interview, 5 June 2014). As a result, the mismatch of evacuation decisions between the affected community and the authorities became the main determining factor for the high death toll in the 2010 eruption (Mei et al., 2013).

In addition to the long-existing lack of trust in the authorities, the contingency disaster response plan was considered inadequate in responding to the extreme 2010 eruption. Specifically, the contingency plans used to respond to past Mt. Merapi eruptions, including the 2010 eruption, had been criticised for being developed based only on the patterns of past smaller eruptions, and not covering the possibility of a major explosive eruption (Thouret et al., 2000, Lavigne et al., 2008, Mei et al., 2013, Donovan, 2010). During the 2010 Merapi

eruption, the local governments appeared to be overwhelmed because of the extensively affected areas and the large number of evacuees. For example, Mei et al. (2013) evaluated that, based on the contingency plans used that time, IDP camps were only prepared to accommodate people living in *Kawasan Rawan Bencana* (KRB) III (Hazard Zone III)[15]; meanwhile, the volcanic hazards impacted the communities within the Hazard Zone II and Hazard Zone I. When the affected communities were instructed to re-evacuate for the third time to areas more than 20 kilometres away, there were no IDP camps prepared beyond a radius of 20 kilometres from the summit. Subsequently, chaos and confusion because of an absence of official information about how and where to re-evacuate, were inevitable.

In this chapter, I present other factors that have been less acknowledged as determining factors of the effectiveness and trustworthiness of official disaster communication, particularly the reasons for the resistance of the local community to the official disaster communication in the Mt. Merapi surroundings. Specifically, I will discuss the perspectives of the affected community and the authorities regarding the effectiveness and trustworthiness of official disaster communication, and the involvement of the community in official disaster communication. Prior to further discussion of the perspectives of the community and the authorities on the official disaster communication, I will discuss the official disaster communication of the Mt. Merapi eruption in order to provide a general understanding of the case. To maintain contemporary validity, my discussion does not solely refer to the formal information flows conducted by the local governments during the 2010 eruption, but also refers to the current policies of disaster management in the Mt. Merapi surroundings.

[15] In the authorized plans and the hazard map, Mt. Merapi is divided into three hazard zones. From the least to the most dangerous, these are: Hazard Zone I (KRB I), which is the furthest area from the Mt. Merapi summit, and potentially affected by mass flows (lahar flood) and/or air fall material (volcanic ash fall and ejected rock fragments (glowing)); Hazard Zone II (KRB II), which is potentially affected by mass flows (pyroclastic flows, lava flows, and lahar flood) and/or ejected material (thick dry volcanic ash fall, volcanic bombs, and other ejected rocks); and Hazard Zone III (KRB III), which is the closest area to the Mt. Merapi summit, and potentially affected by pyroclastic flows, lava flows, rock falls, and ejected rock fragments (glowing) (Dove, 2008; Hadisantono et al., 2002; Sayudi et al., 2010).

4.1. The processes of official disaster communication in Mt. Merapi eruptions

The government agencies and the processes of official disaster communication for Mt. Merapi eruptions are regulated in the Indonesian Act Number 24 (2007). The Act defines that Indonesian disaster management encompasses the formal efforts of disaster-related policy development, disaster mitigation (pre-disaster), disaster response, and disaster rehabilitation (post-disaster). It also designates *Badan Nasional Penanggulangan Bencana* (National Disaster Management Agency – BNPB) as having the responsibility for providing guidelines and directives on disaster management at the national level, which was established by the central government[16] (article 10, clause 2), and *Badan Penanggulangan Bencana Daerah* (Regional Disaster Management Agencies – BPBDs) as the coordinators for local disaster management at provincial and city/district levels (articles 18 and 22)[17].

As the official authorities of disaster management, both the BNPB and the BPBDs cooperate with certain government agencies in responding to a disaster, depending on the type of natural hazard. Regarding a volcano eruption, the Disaster Management Agencies collaborate with the government agencies responsible for the formal vulcanology management. At the central government level, the formal responsibility for vulcanology lies with the Ministry of Energy and Mineral Resources of the Republic of Indonesia (*Kementerian Energi dan Sumber Daya Mineral* - ESDM), specifically with one of its units called *Badan Geology* (Geological Agency*)*. The Geological Agency is responsible for general geological research, including geological resources, vulcanology, and environmental geology. One of its units, which is responsible for vulcanology and geological disasters is called *Pusat Vulkanologi dan Mitigasi Bencana Geologi* (Center for Vulcanology and Geological Hazard Mitigation - CVGHM). Further, the CVGHM is responsible for assessing and monitoring all volcanic activities in Indonesia; the specific unit that is responsible for the vulcanology mitigation process, particularly Mt. Merapi, is *Balai Penyelidikan dan Pengembangan Teknologi Kebencanaan Geologi* (Center for Investigation and Technology Development of Geological Disasters – BPPTKG). The BPPTKG is the government research institution that is mainly responsible for providing scientific recommendations regarding Mt. Merapi, particularly regarding its status level, to the local governments. In summary, official disaster communication about the Mt. Merapi eruption involves all the government agencies

[16] BNPB is headed by a ministerial-level official who directly reports to the President.

[17] Indonesia has five levels of administrative government: national, provinces, districts, sub-districts and villages, consecutively. A village consists of several hamlets.

responsible for disaster management, vulcanology, and regional governance both at the regional and the national levels.

The concept of official disaster communication in this thesis is related to the government regulation, policies and administrative procedures associated with the communication process performed by the levels of government in responding to a Mt. Merapi eruption. The existing official disaster communication process about Mt. Merapi eruptions was developed based on the CVGHM's official flows of volcanic activities (see Figure 14), which is applied to any volcanic eruption in Indonesia; so the information flows are closely related to a dissemination of early warnings. The early warnings of Mt. Merapi eruptions are basically classified into four levels of Mt. Merapi's activities. From the lowest to the highest, these are: Normal (Level 1) when Mt. Merapi is in a normal state of activity; Advisory (Level 2/*Waspada*) when visual observation and seismic data record an increasing volcanic activity; Watch (Level 3/*Siaga*) when the increasing activity shows a continuous trend that is likely to lead to an eruption; hence, people must be prepared for evacuation; and Warning (Level 4/*Awas*) when an ash/vapor eruption starts and may lead to a larger and more hazardous eruption; hence, people have to evacuate (Brown et al., 2015, Surono et al., 2012, Dove, 2008, CVGHM, 2014b).

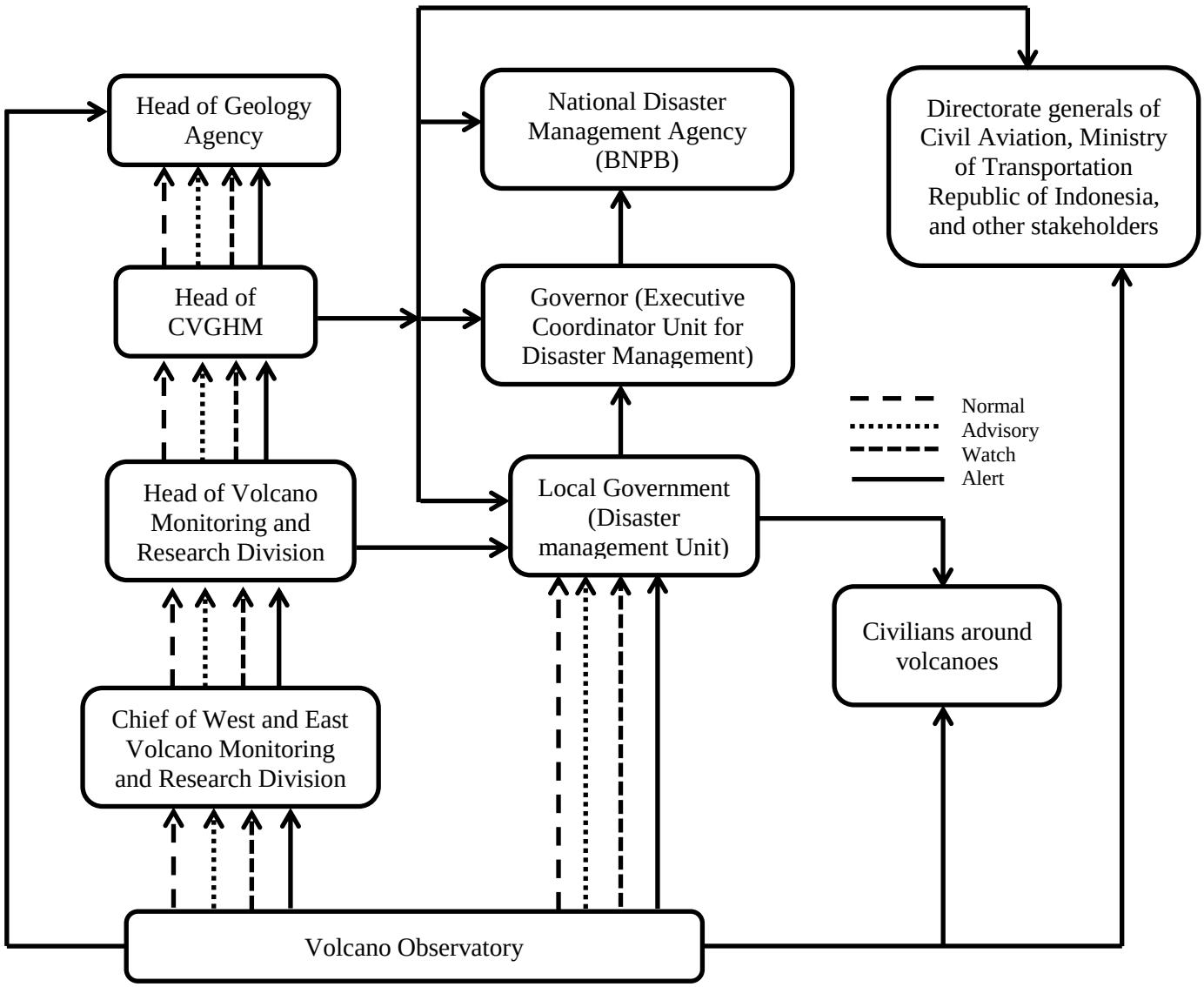


Figure 14. The planned official information flow of volcano activities (CVGHM, 2014a)

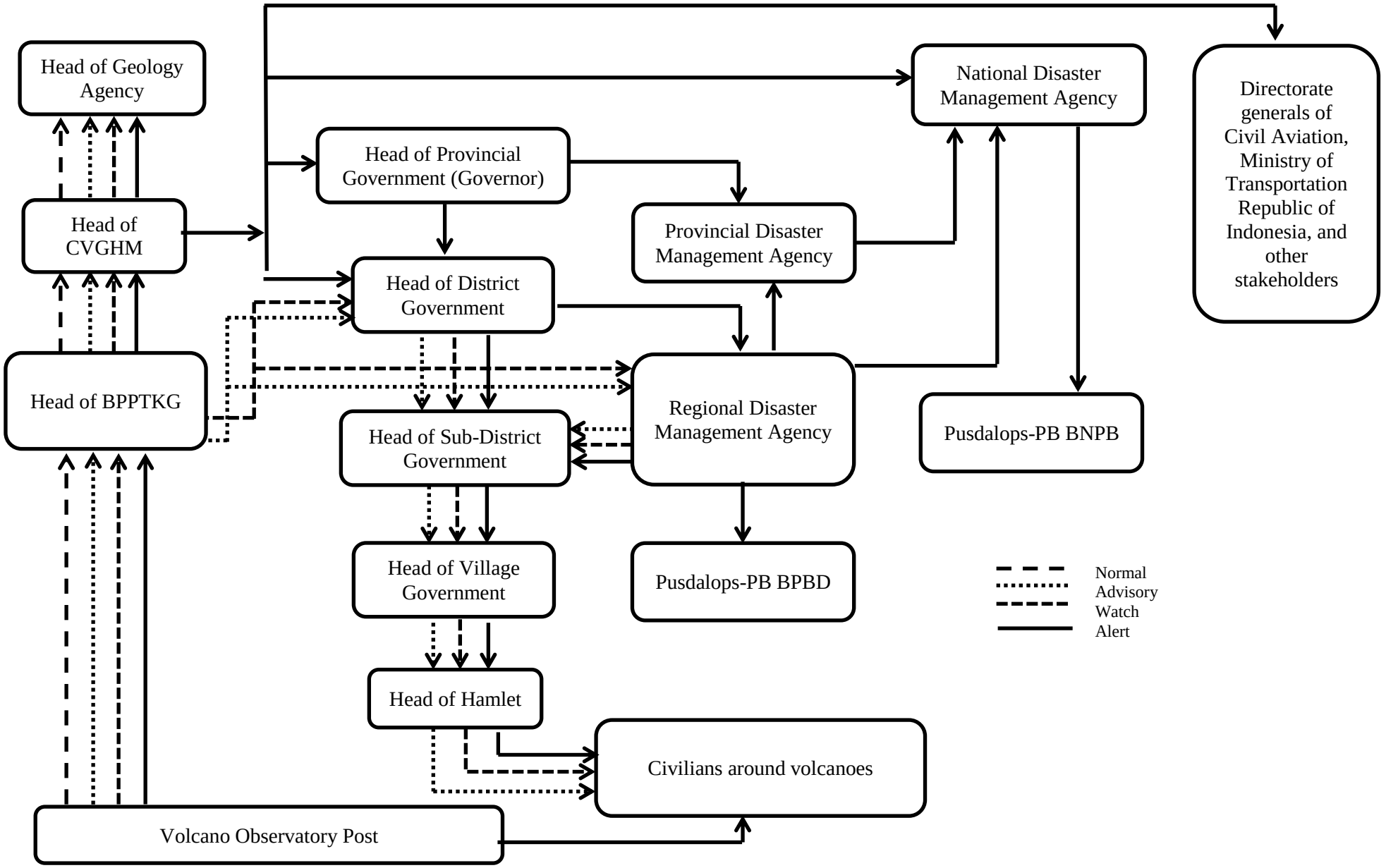
In practice, the research participants in both focus groups explained that the official information flow starts from the monitoring system of the BPPTKG vulcanology research unit's five Vulcanology Observation Posts (the observation posts of Kaliurang, Babadan, Ngepos, Jrakah, and Selo) located 5-10 kilometres away from the Mt. Merapi summit. The initial data is transmitted further to the BPPTKG's main office to be analyzed. The BPPTKG's analysis report has to be officially reported to the CVGHM vulcanology centre before being delivered further to the National Disaster Management Agency (BNPB) and local governments that consist of Heads of Provinces, and Heads of Districts. Furthermore, Heads of Districts deliver the information to the Regional Disaster Management Agencies (BPBDs) and Heads of Sub-districts. Heads of Sub-districts deliver the information to Heads of Villages and Heads of Villages deliver the information to Heads of Hamlets. Finally,

Heads of Hamlets deliver the information to community members by means of face-to-face meetings, two-way radio, and SMS.

The official information about the level of volcanic activities of Mt. Merapi and the official evacuation instruction is treated differently by the authorities. Iman, a district officer, explained that the official information about Mt. Merapi's increased activities to Level 2 and Level 3 can be declared officially by the BPPTKG vulcanology research unit; the official information about Mt. Merapi's increased activities to Level 4 has to be declared officially by the CVGHM vulcanology centre (focus group, 19 July 2014). Hence, information flow about increased status from Level 3 to Level 4 is treated with a longer process. The official information about the level of Mt. Merapi's activity is disseminated further to the community members by the local governments accordingly. Unlike the official information about the level of volcanic activity that becomes the responsibility of the vulcanology agencies, the official instruction to evacuate is declared by the district governments based on the recommendation of the vulcanology agencies. The same process is also applied to siren activation as a tool of an early warning system for evacuation. Sirens are positioned in villages and have to be manually activated by an appointed official, based on the Head of the District's instruction.

Referring to the explanations above, the information flows about early warnings of Mt. Merapi are more bureaucratic and more complex in practice (see Figure 15), compared to the planned information flows in Figure 14. However, I identified that the official information flow does not strictly adhere to the information flows shown in Figure 15 as the focus-group participants also mentioned some "shortcuts" in information sharing in their official disaster communication. For example, the BPPTKG volcano research unit can deliver its information about an increased status from Level 1 to Level 3 directly to Heads of Districts and BPBDs. Afterward, the information flow from the Heads of Districts to the community members is the same as the previous flow that I have discussed above. In exceptional cases, Heads of Sub-districts can directly deliver the warning to community members, based on a recommendation of BPBD regional disaster agencies. Likewise, in addition to coordination with Heads of Sub-districts, the BPBDs can directly coordinate with the Heads of Villages in Hazard Zone III; subsequently, the Heads of Sub-districts forward the warning to the other Heads of Villages in Hazard Zones II and I. Moreover, the BPPTKG volcano research unit can directly inform the community members through sirens in a particularly urgent situation.

Figure 15. The official information flows of Mt. Merapi's early warnings in practice.



When it comes to a formal measurement of a policy/program's effectiveness, there seems to be an absence of an official evaluation of the practice of official disaster communication for Mt. Merapi eruptions. Similarly to Lowrey (2009, p. 48) and Meyer and Rowan (1977), there is a tendency for 'loose coupling' when the government agencies regard their policies as powerful myths and practise their regulations ceremonially regardless of their actual effectiveness. I argue that the information flows of official disaster communication potentially have problems with regard to information redundancy and an absence of feedback loops. Although Austin et al. (2012) and Dougall et al. (2008) outline that redundancy in transmitting the same key messages is effective in encouraging audiences to be more responsive to disaster information, the redundancy is most likely to lead to confusion when involved individuals do not understand clearly the role of each involved agency. In a similar fashion, Butt (2014, pp. 194-195) and Samadhi (2014, p. 179) found that Indonesian disaster management has been challenged by 'institutional complexities' because of the 'regionalization' of disaster policies and authorities between the Indonesian central government and regional governments. The jurisdictional overlap often results in unnecessarily layered and repetitive coordination and an inability to connect multiple emergency plans. Further, the jurisdictional overlap can lead to an institutional paralysis, when the policies over the same issue are inconsistent and not linked to one another (Meyer and Rowan, 1977).

Consequently, information redundancy due to repetitive coordination may ensure acceptance of official disaster information by the intended agencies, but the authorities may face difficulties in producing rapid decision-making, despite the need for a timely response. The lack of ability for prompt decision-making may be addressed by inserting feedback loops from information receiver to information sender, which function as the embodiment of official responses to the disaster information/instruction accepted formerly. For example, a Head of a Sub-district Government will receive the same information about the alert status of Mt. Merapi from a Head of a District Government and a Regional Disaster Management Agency; the information of the Regional Disaster Management agency sent to the Head of a Sub-district was actually the same information that was simultaneously sent by the Head of a District to the Regional Disaster Management agency and the Head of a Sub-district (see figure 15). A direct feedback loop from the Head of a Sub-district to the Head of a District may be useful for preventing repetitive coordination with the Regional Disaster Management Agency on the same disaster information. At the same time, it is important to emphasise that

feedback loops do not necessarily obviate any possible coordination between the Head of a Sub-district and the Regional Disaster Management agency on different disaster information. Without the unnecessary repetitive coordination on the information redundancy, the government agencies may be able to share and make their decisions promptly.

Moreover, when it comes to official disaster communication about Mt. Merapi eruptions, the focus group participants mostly discussed the dissemination of early warnings of Mt. Merapi's status, as if that is the only type of disaster information required by the affected community. In contrast to the authorities' tendency to assume that the affected community only required information about the status of Mt. Merapi, an interviewed community member stated that the information on Mt. Merapi's status was mostly not required after the eruption, because the evacuees could simply gain the information from the closest governmental posts to their IDP camps and television (Gunawan, personal interview, 8 July 2014). From the perspective of an affected community, the interviewed community members specifically identified the types of information they needed right after the first eruption and when they were evacuating in 2010. These were: the most up to date status and condition of Mt. Merapi; casualties; refugees' condition; affected/vulnerable areas; the possibility of further eruptions as the consideration for whether it was necessary to evacuate or not, where to evacuate and how to evacuate; damage; evacuation routes; locations of IDP camps; emergency bags; transportation means and fuel for evacuation; demands for food, clothes, and blankets; aid distribution; refugees' needs; missing persons; physical and psychological recovery; demands for food ingredients, clothes, blankets, and activities; condition of livelihood; farms and livestock; time when they can feed their livestock; time when they can go home for their daily activities; lahars and their levels; traffic updates and road blockages; logistic aid, and demand for food ingredients and water pumps. The numerous types of information demand mirror the findings of other scholars who also identified that the highest community need for information concerns warnings, risk messages, evacuation notifications, scope of the damage, governmental responses, rescue and relief efforts, messages regarding self-efficacy, how to get basic necessities and healthcare (BBC, 2012, Bunce et al., 2012, Reynolds and Seeger, 2005, Seeger et al., 2003, Spence et al., 2007, Spence et al., 2009). Yet, this list shows that the affected community's demand for disaster information in a disaster response is not only limited to early warnings. Thus, the authorities' tendency to solely focus on the information about the status of Mt. Merapi's activity was inadequate on its own to fulfill the information demands of the affected community during the 2010 eruption.

Not just inadequate for the community's need, official disaster communication that focused only on early warning was also inadequate for an effective formal response to the 2010 Merapi eruption, as was clearly stated by this district officer:

> When the [first] eruption happened on the 26 October [2010], everything was unpredictable [...] there was no communication at all [...] some secretaries of Heads of Sub-districts had accidents when they delivered some [official] documents from their offices to the field posts by motorbikes [...] in the middle of heavy ashfall [...] we couldn't use cars because of lots of collapsed trees [...] We were confused about how to gather data on who were responsible for each village [...] how many evacuees there were [...] It was difficult because they were not registered before [...] It [data gathering] was manual. Everything was manual (Sofian, focus group, 19 July 2014).

Similarly to the community's need for various disaster information, the authorities in the focus groups identified the types of disaster information they require for an effective formal disaster response. They are information about assembly points (both for community members and livestock), evacuation routes, locations of IDP camps, fluctuating data on refugees and logistics, missing persons, reports of distributed aid, temporary shelters for livestock, updates on weather, and riverbank conditions. However, the officials seemed to be unaware that the affected communities also require different types of information, in addition to early warnings, in order to be able to respond to an eruption of Mt. Merapi effectively. Consequently, the various types of information seemed to be shared in a limited way among the government agencies themselves, regardless of the fact that the affected community also needs the information. Hence, in designing a message in official disaster communication, the authorities should not solely focus on the dissemination of early warnings, but they also need to acknowledge the other types of information demands from the affected community in order to be able to effectively fulfil the demands.

In summary, I argue that the government agencies seem to focus on practising the formal structure of information flows ceremonially to send out their disaster information, rather than evaluating whether the community can actually access and understand the official information. This shows that the existing official disaster communication has been performed based on institutional logic, which often confines government agencies' formal structures and behaviors into two key goals: the ends which their behaviors aim to achieve and the appropriate means to achieve the ends (Douglas, 1986, Friedland and Alford, 1991, Meyer and Rowan, 1977). However, the institutional logic is frequently inefficient (Meyer and

Rowan, 1977). Meanwhile, the community considers efficiency as one of the most important factors for trusting official disaster communication. In the next section, I will discuss how the affected community perceives the efficiency and trustworthiness of official disaster communication in responding to any eruption of Mt. Merapi, particularly based on the experiences of the research participants in the 2010 Merapi eruption.

4.2. The official disaster communication from the perspective of the affected community

In this section, I focus on the perspective of the affected community, who mostly rely on their perception of trust to follow the advice of authorities (Montgomery et al., 2008). Unlike Steelman et al. (2015) who argue that the affected community is most likely to rely on the authorities and consider them credible, useful, or trustworthy information sources, in this case study I argue the contrary. I argue that the research participants regard the existing official disaster communication process as untrustworthy and inefficient. Specifically, the unidirectional, top-down and bureaucratic approach seems to reduce trust in the official disaster communication regarding the Mt. Merapi eruption, and there is a communication gap due to the inaccessibility and delay of official disaster information.

4.2.1. A lack of trust in official disaster communication

I argue that the the community's lack of trust is based in perceptions of government secrecy and a lack of commitment by the authorities. Firstly, the slow process of sharing official information is considered to be a secretive effort by the local government to conceal disaster information. Adji (personal interview, 22 July 2014), Pujiantoro, and Setiyoko believed that the official information is not always fully disclosed to the community members. Specifically, they stated:

> [I]nformation from the local government is not shared entirely to the community members (Pujiantoro, personal interview, 5 June 2014).

> The status of Mt. Merapi was increased in April. I went to the observatory post to ask directly […] the Head of the Village didn't share the information about the [increased] status […] We had to seek the information ourselves (Setiyoko, personal interview, 8 July 2014).

As a result, the slow and long process of official disaster communication is most likely to embody poor trust and irresolution. This was clearly stated by an interviewed community member, as below:

> [I]t [the process of formal disaster communication] is long and unclear…not convincing […] slow […] we do not know whether it is true or not (Supadi, personal interview, 22 July 2014).

Additionally, some research participants believed that the local governments frequently share false information with outsiders, which does not represent realities. This was clearly stated by a former Combine staff member:

> [I]nformation about Merapi for outsiders frequently cites the version from the government and does not represent the real conditions. For example, in [the] 2006 [eruption], the government declared that they had prepared all transportation needed for evacuation, however, people said that it was inaccurate (because) they had to prepare trucks and buy fuel on their own (Nasir, personal interview, 17 March 2014).

Unlike the interviewed community members who perceived the slow process of official disaster communication in negative ways, the authorities understood the slow process as a form of discretion to maintain reliability and public confidence in the government agencies. In addition to the bureaucracy of information flows, both Sleman and Magelang officers explained that they often had to wait to release information, particularly regarding the increased status of Mt. Merapi, to prevent panic among the Merapi people. In particular, Nurwiyono, a Head of a Sub-district in Sleman, and Yatin, a Head of a Village in Magelang, stated:

> For example, when the status [of Mt. Merapi] was increased to Advisory [level 2] […] We didn't immediately share it [the information] although we already knew it […] I got a call in the afternoon […] We waited for an official announcement from BPPTKG […] It was officially announced at 11:50 pm [by BPPTKG]. Then, we shared it with the community members (Nurwiyono, focus group, 19 June 2014).

> Sometimes we have to consolidate disaster information in a whisper. For example, we didn't release our official information immediately when the status of Mt. Merapi was raised [by the BPPTKG] recently […] we consolidated the information first […] We couldn't share all our information to the community members. They were traumatized, they were panicking (Yatin, focus group, 19 July 2014).

However, the community may regard the waiting period as the period of time required by the local government to conceal or manipulate disaster information secretly. Subsequently, when

the community members regard the authorities as secretive, they are most likely to distrust their official disaster communication.

Secondly, the interviewed community members (including the community radio volunteers) also perceived that the slow official disaster communication process implies a lack of local governments' commitment to the community in prioritizing community safety. In particular, one of the community radio volunteers stated:

> We never directly cite information from the local government. It does not mean that we do not trust them at all. Sometimes, the information that we need is not similar to their need…they do not take action if there has not been any impact yet […] They wait until it reaches a dangerous level *(*Santosa, personal interview, 21 March 2014).

I argue that this finding is related to the discrepancy in risk perception between the local government and the Merapi people. Similarly to several scholars who have identified an incompatibility between the public's risk perception and the authorities' regulatory attention (Dougall et al., 2008, Harvard Humanitarian Initiative, 2011, Nottage et al., 2014, Sandman, 1993, Sandman et al., 1993, Lammers, 2011), most of the interviewed community members emphasized the incompatibility between their local wisdom and the official approach, particularly in regard to evacuation instructions. Not only the local community, but also the interviewed officials acknowledged the incompatibility between the local wisdom of the community and the official approach, as expressed by Yatin, a Head of a Village, below:

> At the village level, we cannot be as strict as at district level. At the district level, everything is regulated by regional regulations […] At our level [village level], the local content is stronger […] That's the difference […] The district level is systematized and not flexible […] If the district [government] decides something […] it has to be based on scientific studies. [Meanwhile], the villagers act based on their nature, then their feelings (focus group, 19 July 2014).

Again, my argument that the local government and the Merapi people have a discrepancy in risk perception mirrors previous studies on Mt. Merapi (Lavigne et al., 2008, Lie, 2012, Schlehe, 1996, Donovan, 2010, Donovan et al., 2012, Dove, 2008, Troll et al., 2015, Triyoga, 1991), showing that the incompatibility of risk perception between the local governments and the local communities has been observed for a very long time. Yet, this incompatibility is still the main challenge in a disaster response to a Mt. Merapi eruption, including in official disaster communication.

The focus of local governments on scientific knowledge and economic-political national interests, aimed at developing appropriate knowledge of Mt. Merapi, has encouraged the tension between the Merapi people and the local governments. In disaster management, the local government applies a scientific and institutional approach by overly focusing on hazard-related factors. For example in relation to the official decision on the level of Mt. Merapi's status, the local governments have been solely relying on the scientific analysis of the BPPTKG vulcanology research unit and neglecting local knowledge, 'which is remarkable, given the ancient and rich tradition on Java of folk observation of volcanic activity' (Dove, 2008, p. 334). Specifically, BPPTKG monitors the volcanic activities of Mt. Merapi through geophysical monitoring on seismic events, deformation, and magnetics; geochemical monitoring on the petrochemistry of eruptive products, and gases emission; visual monitoring of the lateral and vertical distance reached by lethal and non-lethal ejecta, crater development and build up of potential lahar material; and remote sensing monitoring of satellite imagery (Suryo and Clarke, 1985, Triyoga, 1991, Surono et al., 2012, Brown et al., 2015). The rationality of the government's scientific approach is influenced by the nature of institutional logic (Douglas, 1986, Lammers, 2011, Meyer and Rowan, 1977), which assumes that a rational formal structure is the most effective way to coordinate within and control a complex environment. As a result, local governments often attempt to replace the traditional approach with their bureucratic approach (Meyer and Rowan, 1977).

On the other hand, the community members are more likely to practise community-generated knowledge based on cultural rationality, which is often opposed to the scientific facts of the actual hazards. Similarly to the previous studies on Mt. Merapi (Butt, 2014, Donovan, 2010, Donovan et al., 2012, Lavigne et al., 2008, Lie, 2012), I argue that the traditional cultural beliefs have produced a lack of fear, a false perception of volcanic risks, and repeated reluctance to heed the official warnings to evacuate. According to Setiyoko, a community member, some community members have low hazard awareness and refused to comply with the official evacuation instructions because of their local knowledge of volcanic mythology, traditional precursors, and risk perception. He specifically stated:

> At the individual level, the villagers rarely ask the BPPTKG [the vulcanology research unit] or the BPBD [the regional disaster management agency] […] They have their unique beliefs of Mt. Merapi […] they have their own opinions. If Mt. Merapi erupts, it will be this…they observe the "signs" […] because they have been living in the Mt. Merapi environment

> […] The elders know the "signs" showing that Mt. Merapi is about to "work" (personal interview, 8 July 2014).

Another community member, Wulandari agreed:

> At that time (the 2010 eruption), we were not nervous […] Because the elders taught us the doctrine that "it's fine, the mountain is all right" […] I was sleeping with my son […] The volcanic ash got into my house […] There was not fear. It was normal for me (personal interview, 7 July 2014).

The local communities living on the Mt. Merapi slopes, especially the elders, believe that they have inherited the knowledge of understanding the natural signs to predict Mt. Merapi's activities. They assume that earthquakes, lightning, and strange behavior of wild animals must precede an eruption. They believe that the animals are sent by the Mbah Merapi to warn the local community about an upcoming eruption. The beliefs of traditional precursors may be an accumulation of the concrete memories and direct personal experiences of the affected community in past eruptions (Cashman and Giordano, 2008, Cronin and Cashman, 2008, Donovan, 2010, Fischer, 2000, Troll et al., 2015).

Some local community members also believe that the spirit of their ancestors will inform them when Mt. Merapi will erupt and how to escape from its hazards; the spirit will appear in someone's dream or directly come to the sacred elders, including the gatekeeper of Mt. Merapi (Triyoga, 1991). A community member, Setiyoko explained that if any of the traditional precursors did not happen, the at-risk communities were less likely to evacuate because they assumed that Mt. Merapi would not erupt soon (personal interview, 8 July 2014). Again, a volunteer of MMC FM, Mujiono stated that the local people in Boyolali believe that an eruption of Mt. Merapi would not affect them, because their settlements are located on the "back side" of the volcano (personal interview, 26 April 2014). This finding mirrors Donovan et al.'s (2012, pp. 315-316) finding identifying that the personification of Mt. Merapi as a human leads the presumption that Mt. Merapi will only erupt in or "vomit" from its mouth, the western parts of the mountain. An eruption is also often personified as a periodic defecation from Mt. Merapi's 'body', so it will not impact the surface of its body, the villages on the slopes of Mt. Merapi (Triyoga, 1991). Thus, the local communities living in the eastern part of Mt. Merapi slope are less likely to evacuate than those in the western part.

Moreover, Mt. Merapi has become a beneficial asset in supporting local livelihoods by providing the local communities with fertile soil for traditional agriculture, volcanic material

for mining, and beauty for local tourism (Troll et al., 2015, Lie, 2012, Triyoga, 1991). In fact, Lavigne et al. (2008) found that the income of the farmers living on the slopes of Mt. Merapi was three times higher than that of lowland farmers. Consequently, the Merapi people are often unlikely to give up the day-to-day benefits of their livelihoods for the less frequent and presumably predictable hazards (Triyoga, 1991, Dove, 2008). They 'discount' the actual risk they are facing (Bankoff et al., 2015, pp. 8-9) and more people decide to live further up for a better living (Troll et al., 2015)

Yet, the interviewed community members argued that the local governments have not been able to understand how the local communities apply their cultural knowledge to adapt to the Mt. Merapi ecosystem. Nonetheless, the local governments do not totally ignore the cultural behaviors of the local community in Mt. Merapi's surroundings. Similarly to Triyoga (1991), I identified that the authorities at the village level have been collaborating with the cultural gatekeeper in organizing the *Labuhan* ceremony. As stated by a Head of a District, the authorities usually provide administrative support in organizing the villagers and securing the ceremony (Nurwiyono, focus group, 19 June 2014). Another district officer, Aisyah agreed that the local governments have acknowledged the local wisdom of the local communities in the surroundings of Mt. Merapi, which has facilitated the communities' resilience. She specifically stated:

> Mt. Merapi never stops [erupting]. It has its own cycle […] The communities have been living in harmony with nature. So, they are adapting. The Merapi people have already got used to living with Mt. Merapi's eruptions. They know it with their own "language" […] I think that the Merapi people have built their unique wisdom to adapt to the Merapi's characteristics […] They are relatively more prepared and mentally ready for an eruption. Therefore, in a recovery phase, they can be resilient quickly because it is part of their life (Focus group, 19 June 2014).

Yet, the acknowledgement has not been equally applied in official disaster communication. Consequently, the local communities may not be easily influenced by the authorized scientific warnings and have been resistant to the government policies of disaster mitigation and response, such as evacuation and resettlement. Likewise, three officers, Kushartati, Nurwiyono, and Wibowo confirmed that the community members used to enjoy the views of pyroclastic flows and lava, disregarding the official instruction to evacuate (focus groups, 19 June 2014).

As a result of the discrepancy in risk perception, the Merapi people may perceive less risk from Merapi hazards; meanwhile, the government may perceive more risk, or vice versa (Dove, 2008). In disaster communication, when community members consider the local government understates or overstates the risk, the government loses its informational credibility (Sandman, 1993). Consequently, the official information, which may be regarded as valuable by the authorities, may not be equally perceived to be useful or trustworthy by the affected community (Steelman et al., 2015). In this case study, communities believe that the local government is not committed to their safety when agencies share information that is important for the authorities rather than for the affected community.

In summary, there is a pattern that the community's perceptions of secrecy and lack of public commitment due to different risk perception lead to distrust in the accuracy or usefulness of information provided by the government. Moreover, with reference to the community's former experiences of the abuse of government authority over their land (Dove, 2008, Donovan et al., 2012, Triyoga, 1991, Troll et al., 2015), the perception is most likely to lead to an assumption that local governments secretly take personal advantage in their responsibilities to the public; consequently, this may increase the level of distrust (Donovan et al., 2012, Samadhi, 2014) and the community's reluctance to comply with the official disaster information. Unless there in a change in the relationships of authorities to community members, the lack of trust will result in a lack of confidence in the government's actions including in the official disaster communication (Fisher, 2013, Reinhardt, 2015, Samadhi, 2014, Sandman et al., 1993) and 'persistent existential anxiety' (Giddens, 1990, p. 100), regardless of the public's actual need for information.

In contrast to the undermining of trust in official disaster communication, five (out of eleven) interviewed community members expressed their remaining high expectation of local governments, particularly the officials at the village level, for being the front lines of formal disaster communication. They further argued that the authorities are fundamentally the ones responsible for formal disaster management and have the appropriate disaster-related technologies; hence, the authorities have the most accurate disaster information. According to Meyer and Rowan (1977), the logic of confidence is useful as a public assumption that officials are performing their roles in good faith for the public interest, regardless of the lack of official validation of the official disaster communication's efficiency. On the other hand,

the opponents mainly argued that limited access to the government's official channels is still the main problem that needs to be solved, regardless of the level of trust in the local government. Moreover, the bureaucratic system of formal disaster management will most likely be a "domino effect"; if the upper level of local government is not well-prepared, it can be certain that the lower level is unprepared as well.

Regardless of the discrepancy among the interviewed community members, a formal disaster communication process that is accessible and perceived to be trustworthy in many ways is significantly required. Establishing trustworthy official disaster communication is a complex practice that requires a holistic approach embracing various aspects of realities, as the 'outsiders' priorities are often not the same as those they aim to help' (Bankoff et al., 2015, p. 11). As discussed previously, the formal bureaucratic structure of official disaster communication is most likely to 'buffer activity from efficiency criteria and produce ineffectiveness' (Meyer and Rowan, 1977, p. 360). Therefore, in addition to being able to overcome the bureaucratic challenges of layered levels of local government and disaster management agency, official disaster communication should be able to adapt to the external environment by bridging different kinds of knowledge owned by the community and the authorities. This was specifically suggested by a community member, Wulandari: 'the local government should focus on the community by combining scientific findings and the local wisdom of the Merapi' (personal interview, 7 July 2014).

Together with Bankoff et al. (2015), the Sendai Framework of United Nations (2015), Troll et al. (2015), and Triyoga (1991), the argument that the risk perception of the local communities has been strongly influenced by their cultural beliefs suggests the importance of integrating local socio-cultural knowledge in the policy assessment of vulnerability and risk. In other words, official disaster communication needs to integrate the socio-cultural knowledge of how the community members experienced the past eruptions of Mt. Merapi and perceive the existence of Mt. Merapi into the scientific risk assessment applied by the authorities. The engagement of socio-cultural knowledge is important because the knowledge represents how a community perceives its vulnerability and the risks it is facing. Also, the knowledge is most likely to influence how each individual interprets the received disaster information, including early warnings, and an individual may pay more attention to a particular alert. By understanding how an affected community perceives their vulnerabilities and interprets disaster information, the government can measure the existing community capacity in disaster response and assess an appropriate approach to communicating with the

community. Further, bridging the distinct knowledge between an affected community and the authorities may gradually encourage community acceptance (Bankoff et al., 2015) and the trustworthiness and effectiveness of official disaster information, and lead to appropriate community responses. Particularly, trust in government acts as a bond, which provides community confidence in a formal disaster response and gives the authorities the support to make decisions required to establish an effective disaster response (Samadhi, 2014, Reinhardt, 2015).

4.2.2. Inaccessible and one-way official disaster communication

In the Third World Conference on Disaster Risk Reduction held in Sendai, Japan, the United Nations (2015) emphasized the importance of freely available and accessible disaster information. Studying 32 countries, the IFRC (2015, p. 82) identified that an absence of 'the necessary resources' (e.g. information) may have a negative effect on disaster management. However, in contrast to the top-down approach of the official disaster communication, I argue that the official flows of disaster information do not necessarily guarantee accessibility and timely reception of disaster information by the affected community. Adji, a community member said, '[B]efore the Jalin Merapi network existed, we did not know how to get information from the local government' (personal interview, 22 July 2014). Consequently, another community member explained that the community members were only able to passively wait for information from the Heads of Villages or Heads of Hamlets (Supadi, personal interview, 22 July 2014), or, according to a volunteer of Gema Merapi FM, wait for the other villagers living in the higher parts of the Mt. Merapi slopes to evacuate as a sign for their evacuation decisions (Widiyantoro, personal interview, 11 March 2014). Another community member, Purnomo (personal interview, 8 July 2014) agreed:

> There is not an official channel […] We ask the others, "*nggonmu piye*?" [what does happen in your place?] […] We connect to the other community members at the other hamlets.

Dewi, a volunteer of the Jalin Merapi network, told me of her similar experience of the inaccessibility of information for disaster-affected survivors in the 2006 Yogyakarta earthquake[18]. She stated:

[18] The 2006 Yogyakarta earthquake was 5.9 on the Richter scale, and resulted in 5,716 casualties and approximately US$3.1 billion economic loss (Kusumasari & Alam, 2012).

> I experienced the chaos because of the Tsunami rumor in 2006 [Bantul earthquake]. At that time, the activity of the Merapi volcano also increased […] The only information I knew that it [the earthquake] was the effect of an enormous Merapi eruption […] I just knew the truth when my family called and told me that we had experienced a big earthquake, not an eruption of Merapi. We [the affected communities] didn't know […] the outsiders knew more instead (personal interview, 26 March 2014).

Both the national and regional governments tend to perceive disaster communication as only the function of an organizational spokesperson, who disseminates information to general audiences through mass media. It seems that there has not been any channel to deliver local information in a timely manner directly to the affected community members, in order to fulfill their needs for specific types of official and locally-based information from the authorities. At the national government level, Panjaitan, a BNPB officer who worked at the media centre of the Emergency Operation Center (*Pos Komando Tanggap Darurat* - EOC) during the 2010 Merapi eruption, described that the media centre played a role as a liaison of disaster communication between the National Disaster Management Agency, donors, mass media, and community members (personal interview, 25 September 2014). However, only restricted community members were allowed to access information from the media centre and he explained:

> It did not necessarily mean that the community was not our priority, but it was dominated by the information for the President and journalists […] Some community members came to the media center, but it [the number] was limited. They only could access certain things […] Our information was not dedicated directly to the affected community […] There was not such a thing as the community's right to information […] I think a system on how to effectively disseminate the government's abundant information to community members is significantly required […] in such a way that doesn't cause panic [in the community].

Similarly, at the local government level, Suhadi (a staff member of the village government, confirmed that the procedural flow of official disaster information often did not reach down to hamlet level; it only reached Heads of Villages before and during the 2010 eruption,. Consequently, the at-risk community, whose members live in hamlets, could not quickly access official disaster information. In a workshop of UNDP held in Yogyakarta, Subandrio (the Head of BPPTKG) also acknowledged the issue in his welcoming speech. He specifically stated:

> Accurate early warning is not the only determinant of an effective disaster response. But, the key factor is how the early warning can be received quickly and responded to appropriately by the community. So far, we haven't had a solid information system for a disaster response. Consequently, people rely too much on the mass media […] Like what happened in the phreatic eruption on the 18 November [2013] […] In our consideration, it was unnecessary to raise the status of Mt. Merapi […] but, there was another source who stated that the status of Mt. Merapi should have been raised. The mass media "played" around this controversy. It made people confused […] We can prevent this with a solid information system for disaster response, which can be a guidance for the communities living in the Mt. Merapi surroundings.

With reference to the institutional logic of conformity (Lowrey, 2009, Meyer and Rowan, 1977), the institutional tendency to generalize about the audiences of official disaster communication is often inappropriate to the unique conditions of a disaster response and makes it difficult to respond to individual needs. This also makes it difficult for the affected community to seek official information, and also to communicate their needs to the authorities. The argument that the affected community faces difficulty in directly accessing the official disaster information mirrors the study by Tanesia (2007) which also identified the absence of a sustainable information framework that is specifically dedicated to delivering official information to the vulnerable people in disaster zones. Conversely, it is also hard for the authorities to know what is reliable and what people require. Meanwhile, in order to generate effectiveness, an effort of a disaster response needs to be specifically based on the needs of different categories of the affected community (IFRC, 2015, United Nations, 2015).

In addition to making information inaccessible, the government bureaucracy also makes official information flow slowly. Indonesian bureaucracy in disaster management has been recognized as an obstacle to responding to a disaster quickly and effectively in previous studies (Dougall et al., 2008, Mei et al., 2013). In official disaster communication, Haji, a volunteer of K FM, also raised the same problem. He described that by the time the official disaster information, particularly evacuation warnings, reached the community members at the hamlet level, it was often too late or they were received by the community members shortly before an eruption occurred (personal interview, 21 March 2014). Similarly, Supadi, a community member, stated, 'Although the local government has announced its official information, not all community members immediately gain the information' (personal interview, 22 July 2014). Again, Combine (2007) and Sukiman, a volunteer of Lintas Merapi

FM (personal interview, 6 May 2014), took the Merapi eruption that happened on 22 November 1994 as an example of a delayed official disaster communication. At that time, the presence of flaming lava and the movement of pyroclastic flows were reported at 7:30 am, but the community members received the official warning at around 10 am. This delayed warning meant there were approximately 66 casualties. In summary, Sukiman, a volunteer of Lintas Merapi FM, described:

> The government would be trusted more if they they were less bureaucratic in information sharing. It could be directly delivered to the Head of the Village and the community members […] so it can cut down the gap between the government and local communities (personal interview, 6 May 2014).

Therefore, the argument that official disaster communication has been inaccesible and delayed strongly stresses the need for a direct mechanism to deliver official information to the affected community in a timely manner. This is supported by a Head of a Village, Yatin who strongly stated:

> Information is significantly required because the Merapi people are traumatized […] The district authorities are located in the low lying areas of Mt. Merapi, meanwhile, the communities [who live in the elevated areas] can feel any slight activity of Merapi. So, the district authorities have to recognize the need! (focus group, 19 July 2014).

Likewise, Choliq, a BPPTKG officer, agreed:

> In the 2010 eruption, BPPTKG's monitoring system and hazard warning were working well […] However, in fact, there were many victims […] The official procedures of information mechanisms and early warning systems in the government structure were running well, but the process of sending the information to the community failed […] The official mechanism of information dissemination was a long bureaucratic process to reach the communities. That was one of the reasons there were so many victims in the 2010 eruption […] A mechanism of rapid information sharing, hence, is significantly required (personal interview, 5 March 2014).

As a result, a culture of rapid information sharing and the usage of accessible communication technology are required to promote real time access and dissemination of reliable data; these needs also have been acknowledged by Samadhi (2014, p. 175), Jaeger et al. (2007), and

United Nations in its Sendai Framework (2015). They not only make disaster information from both the authorities and the affected community more accessible, the real time access to reliable data can eliminate the gap between the affected community and the local government in disaster communication, so the affected community can effectively decide their responses.

4.2.3. Information silos that lead to confusion

In addition to accessible disaster information, a direct information channel, and interactive disaster communication, I also argue a need for an integrated data bank that can act as the only official information source in disaster communication. When it comes to early warning, the formal information flow seems to be well-distributed from the vulcanology agencies to the local government agencies. Most of the disaster-related information that can assist the formal effort, however, seems to be scattered among various government agencies. For example, in the Sleman government, *Dinas Tenaga Kerja dan Sosial* (the Agency of Labor and Social) has the data on logistic needs; *Dinas Pekerjaan Umum (*the Agency of Public Works) has the data on infrastructure conditions; *Dinas Kesehatan* (the Agency of Health) has the data on community health conditions; the Head of Hamlets has the data on demography, village assets, villagers' assets, livestock, and community disaster savings.

I argue that the scattered official disaster information represents information silos, which are created by the cluster design and sectoral bureaucracy adopted by the local governments. In practice, each cluster tends to distinctly manage its information because of the different goals of the diverse government agencies. Consequently, the scattered silos of official disaster-related information are most likely to create another challenge to the establishing of timely responses in formal disaster communication; the information silos show rather limited information sharing at critical decision-making points during disasters. The argument that the local governments have managed their information in silos is similar to the studies of Butt (2014), Chertoff (2005), Dougall et al. (2008), Harvard Humanitarian Initiative (2011), Murayama et al. (2013), Samadhi (2014) and Sandman (1993).

At the community level, the information silos require the knowledge to classify which information belongs to which agency. Unfortunately, not all community members can identify the responsibilities and official information of each government agency, which may lead to a misunderstanding about intergovernmental functions (Schneider, 2008). Supportively, Gimar, a community member, agreed, 'not all community members can identify which information belongs to which agency' (personal interview, 8 July 2014). He further

explained that the villagers tend to ask any closest government officer whom they know from their personal networks (most likely a Head of the Hamlet or a Head of the Village or an officer of BPPTKG). If that person does not have required information, they would have to follow another bureaucratic process to gain the information from the government agency that owns the information.

Furthermore, this particular issue of information silos is not only a problem for the affected community, but also the lower level of the government. For example, in two separate focus groups, both the Head of a Sub-district in Sleman and the Head of a Village in Magelang requested a particular radio frequency for their official coordination with their district officials. Both the requests were met by the district officials with the same explanation that the district governments have provided a particular frequency for official coordination in disaster response (mostly used by BPBD regional disaster management agencies). The lower-level officials apparently did not recognize the official radio frequency of the BPBD regional disaster management agencies that had already been used for official coordination. This rather shows a lack of official information sharing among the officials themselves. As a result, disaster-related information is unlikely to be exchanged between government agencies, and between government agencies and those from outside their official network, and elaborated for the benefit of the overall system. Furthermore, as Lammers (2011) describes an institutional message as a connecter between different institutional levels, the identification of information silos shows that coordination among different government agencies involved in the disaster response may not be possible.

Interviewees from both the local government organisations and the community members suggested that the official disaster communication requires a mechanism to integrate all disaster information into an accessible and reliable data bank, in order to simplify disaster information seeking and reduce the siloing of information. Yatin, a village head, expounded on the absence of official guidance from a contact person, specifically, about who are the best people to be contacted regarding particular information. He further explained:

> Information has to come from one source […] a reliable one […] it can be the BPBD or whoever […] to ensure the reliability and accessibility of information […] Reliability and timely update matter the most! (focus group, 19 July 2014).

Also, a community member stated:

> There are too many information sources who state different information. It could create confusion because people do not know which one is reliable […] A ”one source” communication flow can reduce the possibility of panic within the communities (Setiyoko, personal interview, 8 July 2014).

In a similar way, Dougall et al. (2008, p. 88) and Samadhi (2014) suggested that centralization of information is fundamental as ‘the gateway for a flood of constantly changing information’ and a comprehensive contact point can facilitate the collaboration among government agencies. It plays a proactive role in ensuring information quality by identifying valuable and reliable messages and disseminating important information rapidly (Tang et al., 2012).

Establishing and maintaining centralization requires bureaucracy in order to control the standardization of conformity among involved stakeholders (Meyer and Rowan, 1977). Bureaucracy is often embedded in a top-down and hierarchical structure owned by a formal organisation such as a government agency. According to Griffin et al. (1999) and Shannon et al. (2014), formal organisations are characterized by a pyramid of hierarchy, logically structured job roles, and standardized guidelines of process. Hence, a disaster communication process performed with a top-down and bureaucratic approach tends to be well-ordered, consistent, and centralized. Yet, similarly to the interviewed community members’ critiques of official disaster communication, the top-bottom approach tends to lack creativity, initiative, and speed in responding to uncertainty (Shannon et al., 2014, Griffin et al., 1999). Thus, the low trust in the authorities caused by the slow bureaucracy, as discussed previously, also needs to be factored in.

In fact, two years after the 2010 Merapi eruption, the BNPB issued a regulation as a formal guidance in establishing *Pusat Pengendalian Operasi Penanggulangan Bencana* (Center of Disaster Management Operation Control – Pusdalop PB); this unit is administratively under BNPB or BPBD, and responsible for managing data and disseminating information to the authorities and community members through the media. In a disaster response, this unit will perform the function of an Emergency Operation Center (EOC) (Regulation of Head of BNPB Number 15, 2012). However, when this study was conducted in 2014, two years after the regulation’s declaration, none of the interviewed community members seemed to know this particular unit, even in a recent context of formal disaster communication. It may

demonstrate an example of the need for socialization regarding new changes within the structure of official disaster communication, because the networks of information flow take time to develop and become robust within the stakeholders, including the community; otherwise, there will be a lack of clarity on who exactly is responsible for official disaster communication. Again, it would reinforce the community's confusion and misunderstanding about government agencies' functionalities regarding who is responsible for what type of disaster information, as previously discussed.

Conversely, the weaknesses of a top-down and bureaucratic approach seem to be the strengths of a bottom-up approach, which is often adopted by informal organisations. As an informal organization consists of personal, loose, and fluid networks of friendships, it can be flexibly responsive and innovative in ensuring effective disaster communication. Additionally, requests for information and help are most likely to be abundant and prompt in the open and loose personal networks (Shannon et al., 2014, Griffin et al., 1999). Similarly, based on his research on the 2004 Aceh tsunami in Indonesia, Samadhi (2014, p. 176) suggested that Indonesian formal disaster management needs to provide some 'shortcuts' and decentralized decision-making. By providing those, each agency can be more responsive to the needs of the affected community and maintain its sense of urgency.

However, regarding the need for centralized disaster communication, a bottom-up approach would lead to even more informal networks and multiple overlapping sources. I found that the community-generated disaster communication that has been performed by the users of two-way radio since the 1990s in the Mt. Merapi surroundings has been increasingly regarded as too "crowded" and unreliable. Despite the long-established communication behavior, all research participants (both the community members and the officials) described that the large number of two-way radio users in the Mt. Merapi surroundings often creates confusion because of their overlapping information. In particular, an interviewed community member described it as follows:

> Maybe HT [Handy-Talkie/two-way radio] can make information [sharing] faster. But like what happened in 2010, HT made people panic. Most information [shared through two-way radio] was unclear and made people panic more. Where should we go? What should we do? […] So, the degree of the community's panic was higher […] The users of the HT usually don't know the real status of Mt. Merapi, but have exaggerated the information […] They don't know the advantages of using an HT […] Individuals often

> buy HT just for showing off. Very annoying! (Setiyoko, personal interview, 8 July 2014).

The users of two-way radio often share different information for a single event, as described by Widyantoro, a volunteer of Gema Merapi FM, and Julianto, a community member, below:

> The users [of two-way radio] create more panic because of the unclear information about where to go and what to do […] They exaggerate information […] they did not really understand the benefit of [the technology of] two-way radio […] Most of them have one just to feel superior and discuss unnecessary issues […] There are so many groups of two-way radio users in one hamlet […] The [information] is overlapping […] Sometimes, they [the users] use unfamiliar jargon […] different terms for the level of lahars […] One said the flood was 30 cm in height […] others said it was knee-height […] They need to uniform their language (Widyantoro, personal interview, 11 March 2014).

> There are so many groups of HT users in a hamlet […] maybe an individual is a member of many groups […] they are overlapping […] One group uses a certain terminology or sign or whatever […] a uniform term is required, particularly regarding the lahars. So, a one metre height [of lahars] is dangerous or not. It's one example of a uniform term […] They are not uniform yet (Julianto, personal interview, 8 July 2014).

Although the users of two-way radio can effectively facilitate a bottom-up disaster communication by promoting community-based information and making disaster information more accessible, they seem to create a demand for information validation accordingly. Similarly, Austin et al. (2012), Hindman and Coyle (1999), Jaeger et al. (2007) and Johnson (2007) agreed that bottom-up communication efforts are often highly uncoordinated, full of a range of accurate and inaccurate observations, as well as diverse advice, and lack mechanisms for information aggregation and validation. Therefore, the need for a centralized disaster communication is unlikely to be fulfilled by a bottom-up approach, because it requires continual organizing, monitoring of credibility, an aggregation mechanism, and additional verification in order to establish a standardized centralized disaster communication (Palen et al., 2010, Palen and Liu, 2007, Harvard Humanitarian Initiative, 2011).

4.3. The official disaster communication from the perspective of the authorities

In contrast to the negative perspectives of the interviewed community members, I identified positive confidence among the authorities when we were discussing how they manage their practice of official disaster communication in the focus groups. The authorities claimed that that they no longer have any problem in their formal disaster communication because of the accessibility of their official disaster information, particularly the scientific messages, through various media after the 2010 eruption. In particular, Wibowo, an officer of Sleman village government, stated:

> I think, at the community level, information is not a problem anymore […] If the community members are confused, they can easily browse Google, or at least the ESDM's [The Ministry of Energy and Mineral Resources of the Republic of Indonesia] website. For the elders, they can be informed because a household, at least, has one two-way radio and one mobile phone. So, everything is clear! (focus group, 19 June 2014).

Similarly, another officer, Kushartati agreed:

> They [the local community] have really understood various channels [of information] […] For example, they have Handy-Talky. They monitor the signal sound of the seismograph [of BPPTKG]. The seismograph is in the science domain. But, the Merapi people have become very familiar with it (focus group, 19 June 2014).

However, despite the confidence of the authorities, Kushartati also emphasized:

> Because I am a government officer, I will tell you good stories for sure […] I definitely tell you that we share our official disaster information with everyone, to the Head of the Village [the low level of local government] […] Maybe the community members themselves can tell you about what they really feel (focus group, 19 June 2014).

Supporting the studies of Bankoff et al. (2015) and Lowrey (2009) identifying the gap between the institutional logic of the official practices and the real demand of the public, this study shows that the affected community and the authorities prioritize different aspects in determining the success of official disaster communication in a disaster response. Unlike the affected community who demand trustworthiness and effectiveness, the local governments and the volcano research unit seemed to focus more on improving the scientific knowledge of the local communities living in the Mt. Merapi surroundings by disseminating scientific disaster information about Mt. Merapi abundantly, and solving the information inaccessibility

by using SMS and social media as the most recently popular media in disaster communication. How the authorities have managed the accessibility of their disaster information and how they have spread their scientific disaster information will be discussed thoroughly in the next sub-sections.

The confidence of the authorities does not seem an appropriate response to the perception of the affected community of how official disaster communication should be trustworthy, effective, and community engaging. Yet, this has become the main determinant of the prolonged gap between the authorities and the affected community in official disaster communication. Prior to following the numerous scholars who suggest community engagement can bridge the gap (Donovan, 2010, Lavigne et al., 2008, Moody, 2013, Murayama et al., 2013, Sandman et al., 1993), I argue that whether the authorities are willing to engage the community has been very much influenced by their perception of the trustworthiness of community-generated disaster communication. Thus, I will also discuss how the officials have perceived the trustworthiness of community-based disaster information in the next sub-section.

4.3.1. Perceived accessibility of official disaster communication

In an effort to increase the accessibility of official disaster information, the BPPTKG volcano research unit developed *Sistem Informasi Kebencanaan Antar Desa* (Village Disaster Information System - SIKAD) in 2012. Unlike the conventional formal information flows, the information of BPPTKG does not necessarily go through the local government in advance, but goes directly to the community members. In SIKAD, the official information about Mt Merapi's activities and status change is directly shared with the registered individuals, as *Simpul Warga* (information nodes) who are considered to have public outreach. By means of a text message (SMS Gateway), the key individuals will disseminate the information further to the rest of the community members, So, they can immediately receive information from the BPPTKG, without the long bureaucracy of the local governments. Conversely, Merapi people can acquire information about Mt. Merapi through the SIKAD's number, phone calls, and the officials' personal numbers. At the time this study was conducted, the BPPTKG volcano research unit had 790 SIKAD users among community members in KRB I, II, and III.

In addition to the SIKAD disaster information system, the BPPTKG volcano research unit has been utilizing social media (Twitter and Facebook) since 2012, together with email, and

two-way radio. Those media have been utilized for the same purpose, which is to directly share their official information with the community members. The BPPTKG sends a weekly email that consists of information about Mt. Merapi's activities to some community members who subscribe to BPPTKG's emailed update. Also, BPPTKG broadcasts the signal sound of its seismograph through the frequency of BPPTKG's communication radio. However, the local governments seem to adhere more to their conventional face-to-face meetings in order to disseminate their official information to the Merapi people.

In regard to online disaster communication, the authorities did not utilize social media during the 2010 eruption; they mainly focused on their official websites in order to disseminate their disaster information. One of the Sleman officers, Kushartati explained:

> We published all of our disaster information online on our website… During the emergency response, all official disaster information of BPBD [the regional disaster management agency] was uploaded onto the slemankab.co.id [the official website of the Sleman district government]. The emergency response was around November 2010 to May 2011 […] The information about Mt. Merapi's current condition, the evacuees' needs, the evacuation routes, the locations of the IDP camps, donations, including the level of rainfall (focus group, 19 June 2014).

At the present time, it is possible that districts are using social media to communicate with communities, because there is an increasing tendency for government agencies to set up social media accounts rather than establishing or updating their own website (IFRC, 2015). However, when I asked about the Facebook accounts of BPBD Sleman and BPBD Magelang in my focus groups, none of the officers present could discuss it further because both representatives of the Sleman and Magelang Regional Disaster Management Agencies (BPBDs) left the focus groups early, and the Agencies of Communication and Informatics of Sleman district and Magelang that are responsible for managing all districts' official information did not show up in the focus groups.

The official attempts to directly disseminate disaster information through the SIKAD disaster information system and social media do not seem to be sufficient to solve the inaccessibility of official disaster information. Setiyoko, a community member (personal interview, 8 July 2014), and Sukiman, a volunteer of Lintas Merapi FM (personal interview, 6 May 2014), separately stated that some Merapi people still do not know how to access official disaster information from the local government. Specifically, Setiyoko stated:

> So far, we don't know […] the evacuation points, where the IDP camps […] We just know that the roads are the evacuation routes […] we don't know where to run […] just run! That's the most important thing […] until now […] I heard that there will be a sister village or whatever. If there is an eruption, we will evacuate into the village. The information has not been socialized yet […] I know it because I asked my friends who are working at the village government […] Otherwise, I know nothing!

Again, this supports the previous argument that disaster communication solely focusing on early warning is inadequate. Additionally, both Setiyoko, a community member (personal interview, 8 July 2014), and Sukiman, a volunteer of Lintas Merapi FM (personal interview, 6 May 2014) also stated that most of the community members on the Mt. Merapi slopes are not familiar with the official communication channels, such as the SIKAD system and social media, that were used by local government. This finding leads to my argument that it is important to select the media which the targeted community is familiar with in official disaster communication. The argument will be discussed in detail in the next chapter.

Moreover, the formal attempt to involve social media in existing disaster communication does not solve the issue of undermined trust in the local governments. All interviewed community radio volunteers expressed their ingrained undermined trust in online official disaster communication. They reckoned that local governments, especially those which are responsible for disaster management, have a lack of online disaster communication skills within their human resources. In practice, local governments have been handling their online media in a similar way to their conventional communication processes, which are not appropriate to online media. Despite being interactive media that can facilitate bottom-up communication, Chatfield et al. (2014) found that the Indonesian governments still adopt social media superficially to merely inform the community members in a conventional top-down and uni-directional manner. A community member, Zakaria also raised the same issue as follows:

> Government bureaucracy creates difficulties in working with social media. Compared to the social media accounts that are managed by civil society, the governments have lower credibility […] The work of civil society is based on pure mutual responsibility […] Government uses social media because of the bureaucratic demand, not as a social movement. Different motivation will lead to differences in content and speed […] The government's social media accounts can be more suitable for a comparison with other information sources […] not for the main reference because of their information delay (personal interview, 27 June 2014).

Additionally, the government's websites often function in a limited way as 'a collection of documents, forms, and positive press about the agency whose site it' (Jaeger et al., 2007, p. 601). Consequently, as stated by an interviewed community member, a local government's website has not become a better means of accessing official disaster information during a disaster response (Ramawanti, personal interview, 24 July 2014). Confirming the lack of interactivity in the existing online official disaster communication, Panjaitan, a BNPB officer (personal interview, 25 September 2014), stated that the questions asked by the community are often responded to slowly or not at all, yet, rapid response is necessary to reduce uncertainty in disaster response.

The asymmetrical communication or the lack of interactivity in the official disaster communication seems to be influenced by the institutional logic of bureaucracy. When official disaster information is shared from a bureaucratic structure, it will be classified as an institutional message (Lammers, 2011), which dissociates the senders from the recipients. So, the officials are protected from the responsibility for acting on or responding to the message (Lammers, 2011, Watson, 1997). Again, the officials seem to merely adopt social media based on their institutional logic of the goal, regarding the ends to which their behaviors aim (Douglas, 1986, Friedland and Alford, 1991, Meyer and Rowan, 1977). Presumably, the officials may assume that solely disseminating official disaster information through social media is the end of their official disaster communication. Information shared through social media is more likely to be accessed by the community, compared to other official media, so it seems to be considered as fulfilling their aim of delivering their official information to the public. Unfortunately, again, the sense of "fulfilling" the aim of official disaster communication does not seem to include following up on the public's response to the information shared previously.

The local governments are perceived to lack the skill/expertise to adapt the interactive characteristics of online media into their official disaster communication. By not engaging in interactive dialogue local governments' social media use suggests they do not understand the critical value of receivers' feedback and community engagement. This attitude makes it difficult to reduce uncertainty and produce trustworthy disaster information (Steelman et al., 2015, Tang et al., 2012). The value of interactivity for encouraging trust also applies to more conventional offline disaster communication.

4.3.2. Spreading the scientific disaster information

In this case study, the authorities seem to simply consider that spreading as much as scientific information as possible can be the best bridge for the gap between the community members and themselves in official disaster communication. This tendency is also recognized by Sandman (1993) who observes that technical people often simply respond to the public's science illiteracy by presenting the technical data more thoroughly. Unfortunately, the official attempt to disseminate the scientific information does not seem to be well-accompanied by "translation" of the scientific information based on the level of science literacy of the targeted community.

Taking the example of the effort of the BPPTKG volcano research unit in sharing its seismograph's signal, Choliq, a BPPTKG officer, confirmed that the signal often results in confusion, as below:

> We use seismograph […] It sounds similar in indicating lahars and pyroclastic flows. This problematically creates panic, because communities do not understand the meaning of the signal's increasing sound. They just can interpret that the instrument is showing an activity, but, they don't know the detail, whether it is a lahar or a volcanic earthquake. Therefore, they still need to verify the increasing signal by contacting BPPTKG (personal interview, 5 March, 2014).

Another BPPTKG officer, Pamungkas added that some community members, unfortunately, often misinterpret the aspect of open data by publishing "raw" data on Mt. Merapi. They access the raw data from the BPPTKG's monitoring equipment, interpret the signal based on their knowledge and share it on their social media accounts or mass media. In particular, he stated:

> They even bought their own detectors and uploaded its raw data onto their Facebook accounts […] The community may have their own "standard" based on their local knowledge and their visual observation on the Mt. Merapi volcano […] It might be scientifically incorrect (focus group, 19 June 2014).

Consequently, the community members may spread inaccurate conclusions which lead to misconceptions.

Again, taking the SIKAD disaster information sytem as another example, the BPPTKG volcano research unit seems to put the important role on the key individuals, who act as

information nodes between the community members and BPPTKG. I assume that the BPPTKG expects the key individuals to have the ability to translate scientific information into the local language that can be easily understood by the community. Hence, the information nodes can act as bridges for the knowledge gap between BPPTKG and the community members. However, leaving the community members alone without official guidance for interpreting the scientific information is potentially risky. Unsystematic and too-technical disaster-scientific information is often too convoluted to be easily understood by the lay public (Butt, 2014, Chatfield et al., 2014). Hence, the lay public need to have adequate capacity to 'engage meaningfully' with scientific disaster information (HFP, 2007; Shannon et al., 2014, p. 636). If the key individuals do not have sufficient understanding to accurately interpret the BPPTKG's scientific information, it is most likely to lead to confusion and misunderstanding. Furthermore, the official disaster communication is most likely to be framed as 'ineffective communication', 'poor trust', and 'low credibility' (Reynolds & Seeger, 2005, p. 47).

In addition to the previous argument that the authorities need to bridge traditional knowledge and scientific assessment in their official disaster communication, I argue that the authorities also need to carefully decide ways of sharing scientific knowledge on an ongoing basis. The SIKAD disaster information system of the BPPTKG vulcanology research unit may be efficient for generating prompt official disaster communication by cutting through the bureaucratic process and directly sending out scientific information to the affected communities. However, it does not necessarily provide a timely local understanding of the scientific information due to the lack of scientific vulcanology knowledge among the Merapi people. Scientific disaster information needs to be translated into a local language so the information can be accurately and easily understood by the local community. From the perspective of an affected community, moreover, the sole usage of official language (often solely based on scientific explanation) may be considered to overly emphasize the understanding from the government's side, the authority of the government, and the exclusivity of government. Subsequently, it can drag the government further away from the local community and be most likely to widen the controversy of public-versus-expert risk (Sandman et al., 1993). Moreover, Sandman et al. (1993) have identified that providing more technical details of scientific information has no significant effect on the public's perception of risk. Hence, if the effort of disseminating scientific information of Mt. Merapi as much as

possible is aimed at convincing the at-risk community to increase their perceived risk and be more cooperative in evacuation process, it is unlikely to succeed.

Therefore, bypassing the slow bureaucratic system by simply disseminating scientific data does not automatically bridge the gap between the authorities and the at-risk community in official disaster communication. Slower information flows may be presumably more useful in designing scientific information as it moves down the chain. Within the existing official information flow (see Figure 15), the layered levels of government agencies may have important roles in designing the scientific information from the BPPTKG vulcanology research unit to be more relevant to the local communities on the slopes of Mt. Merapi. Therefore, in addition to the definition of institutional messages as 'intentional, enduring, have a wide reach, and encumber the participants to engage in certain behaviors or take actions' (Lammers, 2011, p. 174), I emphasize the importance of designing disaster information so it can be relevant to people with different local needs in different contexts. However, it is also important to identify that slower information flows may have a negative side, as they may require longer times and lead to delayed information flows that can put the affected community in danger during a disaster response.

4.3.3. A lack of trust in community-based disaster information in official disaster communication

Authorities often evaluate community-generated information from their institutional logic, which is different from the perspective of the community (Bankoff et al., 2015, Sandman et al., 1993). As a result, the local governments demonstrated a lack of trust in community-based disaster communication, although they acknowledged the value of some of the practices around Mt Merapi. In the focus groups, the officials strongly acknowledged the strong initiatives and social capital of the Merapi people in disaster management, through practices like community-initiated money savings for disaster responses, self-organized evacuation, and voluntary collective actions. They also recognized that the community members, as first responders, can be the first information sources because they know exactly what is happening in their surroundings before the authorities arrive in the affected areas. A head of a sub-district, Nurwiyono gave an example:

> Regarding lahars, the users of two-way radio can solve the limitation of the authorities. The authorities tend to use CCTV, and take time to reach the lahar. Meanwhile, the community can quickly reach the river bank to

> observe the lahar's height level and the scope of damage. They better understand the areas and are more valid. They can be sources of information […] the community members can inform us from the elevated areas; particularly if any accident occurs. So, we can be on standby and prepare the appropriate response in low areas (focus group, 19 June 2014).

Similarly, Panjaitan, a BNPB officer, agreed that the local community could have been engaged as an alternative information source during the 2010 eruption, due to an overwhelmed local government. He specifically explained:

> We (the BNPB's officials) were not familiar with the Mt. Merapi surroundings […] It was more effective to engage volunteers to gather information from community members and to deliver official information to community members […] the local officials had lots of responsibilities […] they were most likely to miss some things […] Therefore, besides being the first responders, we can engage the community to be volunteers for themselves […] As far as I know, they always think that they are victims. Yes, they are. But, they can do something, right? All they do is just sit at the IDP camps. I think that there is a way to make them useful to the others during a disaster response […] We can give them two-way radios […] "You let me know what is happening. Don't you just sit and do nothing". So, they can do something for themselves (personal interview, 25 September 2014).

In spite of the acknowledgement of community capacity in providing local information, the officers did not seem to regard it as providing reliable and verified information in disaster communication. The officials emphasized in focus groups that community-based information cannot be automatically considered in a formal response; it has to be verified by the authorities in advance. The officers, accordingly, frequently stressed that the government is the only official information source; only the official information, issued by the government, is allowed to be delivered further to the community members. A BNPB officer, Panjaitan stated:

> All community-based information has to be verified, in order to make it reliable […] BNPB cannot rely on personal information […] All information has to be verified institutionally or, at least, derived from an authority […] As a government institution, all responses of BNPB have to be accountable […] Local government is the only reliable information source (personal interview, 25 September 2014).

A Head of a Sub-district, Nurwiyono also stated:

> Is it [community's information] reliable? […] The other day, there was information about Mt. Merapi releasing lava. But, after we checked its source, he said that he got it [the information] from something "someone said". He didn't see it personally. This is unreliable! (focus group, 19 June 2014).

Similarly to the argument of the inability of community members to rapidly conduct decentralized communication, the unorganized and unverified nature of their information has become the main argument about the difficulty of integrating community-generated disaster information into official disaster communication. However, the existing official mechanisms are not in themselves able to rapidly collate, analyse, and transform community-based information into the knowledge required for decision-making (Harvard Humanitarian Initiative, 2011, Jaeger et al., 2007).

Consequently, I argue that community-generated disaster information is only used by the authorities as additional data or as a comparison to the other information sources. Drawing on his experience using the community-generated information shared in the Jalin Merapi network, Susetya a Magelang officer, specifically stated:

> I only used the information [of the Jalin Merapi network] as back-up information for our main responsibilities […] It was not considered to be a main reference […] We were confident that our data was more updated […] more valid (focus group, 19 June 2014).

This argument is similar to the studies of Austin et al. (2012), Hindman and Coyle (1999, p. 18), Jaeger et al. (2007) and Johnson (2007) that community members (including those who are mediated by social media) are often treated as 'secondhand sources of information' and cannot automatically become official communication sources.

However, I argue that the degree of distrust in community-based information varies among the officers. In comparison to Reinhardt (2015) who found that the affected community tended to trust their local governments more than the central government in responding to the 2005 Hurricane Katrina, my findings suggest the opposite result in this case study. The lower levels of government, such as district, sub-district, village, and hamlet officials, seem to have more trust in the community members than the district governments. In the focus groups, for instance, these officers always referred to the users of two-way radio when they were discussing community-based disaster communication. The disaster information provided by

the users is more likely to be taken into consideration by the village and sub-district governments than the district government, as expressed by Nurwiyono, a head of a sub-district:

> There are some groups of two-way radio users that are often considered to be community-based references for the sub-district and village officials. They are SKSB and AMC, as the oldest groups in Cangkringan sub-district […] However, they are increasingly too crowded and unreliable (focus group, 19 June 2015).

The argument that the lower government level has a lower degree of distrust in community-generated disaster information is similar to that in the study of Donovan et al. (2012) where the Heads of Hamlets sampled in the Mt. Merapi surroundings actually trusted more in their residents, who shared the same cultural beliefs; but they had to obey the official instructions of their higher levels of government. Therefore, this argument reflects that the greater trust in community-based disaster communication comes from officials who are closer to the communities.

The focus group participants argued that the main reason for their lack of trust in community-originated disaster information was the excessive risk perception of the community members. The officials described that the local communities on the Mt. Merapi slope tended to overestimate risk, panic easily, and be likely to share any information they gain without verifying it. A Head of a Village, Yatin specifically explained:

> [M]aybe they [the community members] are still traumatized by the 2010 eruption […] when they [the community members] feel or hear something from the Mt. Merapi [summit], they will ask me anxiously. 'What is happening? What should we do?" […] The BPPTKG has not officially raised Mt. Merapi's status, but they have raised their "status" of anxiety unofficially (focus group, 19 June 2014).

After the 2010 Merapi eruption, there was a change of attitude to disaster response within the local communities living on the Mt. Merapi slopes. Both the community members and local government officials I interviewed confirmed that the Merapi people still tend to ignore the instructions for evacuation or, on the contrary, do self-evacuation regardless of official instructions. Unlike their former perception of low risk, the local community has become overly responsive because of their trauma during the 2010 eruption. They tend to make their decision on evacuation based on their interpretations from observing Mt. Merapi and what happens in their surroundings. A minor change of visual observation of Mt. Merapi's

volcanic activity can easily cause anxiety and independent evacuation accordingly. A Sleman officer, Wibowo explained:

> The communities do not want to hear anyone anymore when they worry […] The Head of a Hamlet is only able to remind them not to evacuate in panic […] those who feel afraid and traumatized by the 2010 eruption may go down, but be careful. Please don't run (focus group, 19 June 2014).

In a separate focus group, Gunawan, a Magelang officer also stated that there is an unofficial agreement among the community members that they will evacuate independently at Level 3, regardless of the fact that an official instruction for evacuation will be released at Level 4. Similarly to the fact that local governments cannot enforce the communities to evacuate, the authorities also cannot prevent the communities from self-evacuating (focus group, 19 July 2014).

Although the officials argued that the community's perception of excessive risk Shas become one of the main determining factors of their lack of trust in community capacity to respond effectively to an eruption, I argue that the excessive risk perception results from the increased distrust in the local government by many community members, which has been caused by their perception that local governments are secretive and incapable (as discussed previously). More importantly, the community's perception of the communication behaviours of the local government has stronger effects on their perception of risk and their level of trust in the local government, in comparison to the effects of culture. Before the 2010 eruption, the local communities living on the slopes of Mt. Merapi have shared a perception of low risk of volcanic hazards; their cultural beliefs have been accused of encouraging the low-risk perception, which led to distrust in the local government. However, after the 2010 eruption, the level of distrust in the local government and the perception of risk of the local community have been increasing significantly, regardless of the fact that their cultural beliefs remain the same.

Based on the findings, I argue that the distrust and risk perceptions of the local communities on the Mt. Merapi slopes significantly increased when they perceived that disaster communication behaviors of the authorities had been inappropriate. Again, the disillusion may result from the agencies' former attempts to maintain internally rigid conformity by isolating the community from their official disaster communication process (Meyer and Rowan, 1977). This argument is supported by Sandman et al. (1993) who found strong correlations among agencies' perceived trustworthiness, secrecy, and a community's

perception of risk. Therefore, in addition to the importance of an effective message design and channel, the ways the authorities conduct their official disaster communication play significantly important roles in encouraging trustworthiness; this argument is supported by Giddens (1990, pp. 33-34) who identifies that trust in abstract systems, such as official disaster communications, more 'concerns their proper working rather than their operation as such'. Moreover, the government agencies cannot only disproportionately preserve their practices of official disaster communication as legitimate policies that must be taken for granted by the community; the authorities also need to convince the community that their practices actually work for the affected community.

4.4. Community engagement as a bridge between the different perspectives of community and authorities in official disaster communication

According to Donovan (2010), Fraser and Estrada (2001), Lavigne et al. (2008), Moody (2013), Murayama et al. (2013), and Sandman et al. (1993), authorities would be able to reduce public unease if they were willing to be responsive and engage community members, rather than providing more technical information. In the Sendai Framework, the United Nations (2015) also emphasizes enhancing collaboration with local people to disseminate disaster information. However, engaging the community is often perceived by government agencies as a formal-control sharing, which becomes the most common controversy between community and government. Government agencies are often reluctant to acknowledge the de facto veto on the community and share their formal control with the community (Sandman, 1993). Meanwhile, community engagement within a collaborative system can generate a sense of accountability for all levels of government (Chatfield et al., 2014, Jaeger et al., 2007, Samadhi, 2014, Sandman, 1993), and make official disaster communication more trustworthy (Steelman et al., 2015, Tang et al., 2012, Harvard Humanitarian Initiative, 2011).

In contrast to the studies presenting that community engagement leads to trustworthiness, I argue that the relationship between community engagement and trustworthiness also works in the opposite way. Specifically, the authorities' lack of trust in community-generated disaster information has led to undermined community engagement in their official disaster communication. A community member stressed a lack of community engagement within official disaster management, particularly by the district governments (Wulandari, personal interview, 7 July 2014). Likewise, Sukiman, a volunteer of Lintas Merapi FM stated:

> The sub-district and village governments have been supportive in sharing information rapidly. They also frequently involve and invite the community members for coordination […] At the higher levels of district government, the BPBD still think that we are powerless and cannot do anything […] We are victims and the first responders. We have acted when the local government hasn't responded [to an eruption] yet. Why? We realise that if we waited for the authorities, we would have died [before they came] […] When people are treated as powerless, they will be powerless. Yet, we have our own capacity. The government makes us look vulnerable and powerless (personal interview, 6 May 2014).

The finding of a lack of community engagement does not only occur in the case of the Mt. Merapi eruption, as Chatfield et al. (2014) and Tanesia (2007) also found similar evidence of a scarcity of official citizen-originated disaster communication in other areas in Indonesia. Moreover, as previously discussed, the lack of community engagement does not only apply to the lack of engagement of the local actors, but also to the lack of engagement of the community's cultural knowledge in disaster management of Mt. Merapi eruption. How the culture of local villagers living on Mt. Merapi can be engaged in disaster communication will be discussed in the next chapter.

Unlike the interviewed community members claiming a lack of community engagement, the officials in the focus groups claimed the existence of community engagement in their official disaster management. For example, the officers of Sleman explained that the government has been engaging the community members in the Early Warning System (EWS)[19]. Specifically, they appointed two community members, who live near the EWS, to be responsible for monitoring it. In the case of an emergency, they may turn on the sirens if they do not start automatically. Kushartati, a Sleman officer, added another example:

> We already have good intentions to open communication related to disaster management as much as possible […] We have the Sleman Disaster Information Network (SDIN) […] www.sdinslemankab.wordpress.com […] a website that has been provided for the community […] they can submit any disaster information to the website in the form of news […] It was one of the real implementations of a communication channel in our disaster management. The local communities are the information sources, not us. We call it civil journalism as the community members may submit their self-written news without it being edited by BPBD (focus group, 19 June 2014).

[19] EWS utilizes sirens that are stationed in almost all Sleman's hamlets.

Although the arguments were raised as an example of community engagement by the officials, this suggests an incompatibility in perceived engagement between the local government and the community members. Similarly to the traditional approach of official disaster communication, the official engagement in EWS limitedly treats the role of community as a passive party who has to wait for the government's unidirectional instruction to turn on the sirens. On the other hand, the community members, including the community radio volunteers, demanded community involvement by engaging the community's social capital in such an interactive way, in order to establish an effective and collaborative official disaster communication. I also found that the website of SDIN is totally empty; it does not have any community-generated content at all.

Unlike the other officers, an officer of the Sleman district confirmed the lack of community engagement in official disaster communication. He strongly argued that the information provided by community members through two-way radio does not meet the official standards of the operational procedure of radio communication, so it cannot be included in formal disaster communication. He specifically stated:

> [T]he language (the codes of radio communication) is regulated by ITU [International Telecommunication Union]. The officials use code 8, ORARI [Indonesian Amateur Radio Organisation] use code Q […] they [the community members] use disorganized language […] their random terminologies cannot be considered in our official communication […] to be able to get involved, they have to adapt to the official language […] so their disaster information can be valid and disseminated further to government agencies (Sunyoto, focus group, 19 June 2014).

Nurwiyono, a head of a sub-district, agreed:

> [A]lthough we [the officials at the village and sub-district level] can understand the terminologies of the two-way radio users, we only can listen to them […] They still have to comply with the official regulations of disaster information in order to be considered in the official disaster communication (focus group, 19 June 2015).

This is supported by the Regulation of the Head of BNPB Number 6 (2013) that regulates that the BNPB national disaster management agency and BPBD regional disaster management agencies are obligated to use code 11 and the official call-signs in radio communication during a disaster response. Therefore, in order to be able to be considered

reliable, all kinds of community participation have to be performed based on the official guidances (Regulation of Head of BNPB Number 11, 2014, article 15).

I argue that the lack of community involvement in formal disaster communication is reinforced by the difficulty of translating the community's daily language into the official language of disaster communication. The difference between institutional speech and ordinary language has been stressed by Lammers (2011), who describes institutional speech as the 'language in work settings situated in organisations'. The incompatibility between community language and official language is somewhat similar to the previously discussed argument of the incompatibility between scientific themes used by the authorities and the community's scientific literacy. Again, they strengthen the importance of the usage of a mutual language that can be understood and accepted by both the authorities and the local community. When both the local community and the local government can understand the language used in disaster communication, they can exchange their information more effectively (Troll et al., 2015). Furthermore, the mutual understanding is most likely to encourage community engagement (Shannon et al., 2014, Wilby, 2010) in disaster communication and assist the affected community to decide appropriate responses.

Therefore, I argue that engaging the community, particularly the informal community leaders who have genuine concerns about the communities' interests and are considered to have expertise in local cultural knowledge, can facilitate trustworthy and participatory disaster communication. Supportively, two interviewed community members, Pujiantoro (personal interview, 5 June 2014) and Zakaria (personal interview, 27 June 2014), stated that identifying and engaging appropriate leadership will effectively lead to the community's trust and participation. Another interviewed community member, Setiyoko added that another advantage of community engagement is that it will accelerate the process of information sharing between the community members (personal interview, 8 July 2014).

The argument of the important role of community leaders in disaster communication is similar to that in the study of Lavigne et al. (2008, p. 284), identifying that informal community leaders play 'a more important role than the one played by the authorities' in community decision-making in the Mt. Merapi surroundings. Additionally, disaster information delivered by informal leaders would be taken more seriously by the rest of the community members (Shannon et al., 2014), because they have been regarded as the local experts (Aw, 1992) who can simultaneously provide assurance and a safe feeling for the

community members (Triyoga, 1991). The engagement of community leaders is actually legally supported by the Regulation of the Head of BNPB Number 11 (2014) which regulates that the communities, especially those that are established based on geographical proximity (*Gemeinschaft*), have to be significantly engaged by considering their local traditions and independent leaderships. However, although engagement with community leaders as 'information brokers' can significantly increase the effectiveness of information exchange, this remains less prioritized in the official disaster communication (Wenger, 2000; Shannon et al., 2014, p. 641).

In practice, community engagement is not only beneficial for the community members, but also for a government agency that is willing to do so. For example, in contrast to the district governments, the interviewed community members including the community radio volunteers considered that the BPPTKG volcano research unit has been more willing to engage the Merapi people by combining their local knowledge with its scientific findings. According to a community member, the BPPTKG frequently asks the locals about what they see and hear from Mt. Merapi (Adji, personal interview, 22 July 2014). Subsequently, they believed that their information would be used to compare with or confirm the BPPTKG's scientific information emerging from its monitoring equipment, as stated by Sukiman, a volunteer of Lintas Merapi FM:

> The good thing about the BPPTKG is they don't only rely on the technologies. The technologies and the local wisdom in observing the volcano […] They are willing to listen to us […] Sometimes, they invite us […] A day before the BPPTKG officially increased the status of Mt. Merapi to *Waspada* [level 2], Choliq [a staff member of the BPPTKG] asked me "How's the mountain? What did you hear? […] They are scientists, yet, they confirm it [the scientific findings] with the local wisdom (personal interview, 6 May 2014).

The particular approach also has been suggested by Kahneman (2011, p. 145) and Shannon et al. (2014) who emphasize co-production of disaster knowledge by combining a community's 'emotion and intuition' and local government's expertise. Similarly, Panjaitan, a BNPB officer agreed:

> There are some ways to get information […] technologies are important […] but, there are also the community members. They are the ones who know the information about changes within the [affected] community when the volcano erupts […] So, actually we can use their information…they are the

> first responders […] We have to respond to the first responder, but not rely on […] meaning that we have to filter it [the information] […] We ask the experts whether it is true that the volcano will erupt or not. If the community thinks that we have to evacuate because snakes have gone down the volcano, we can't do that. We have to check what the technologies say about it. But, if the community has accurate information, why not? […] We have to listen to them […] don't ignore them […] involve the community (personal interview, 25 September 2014).

Moreover, an Indonesian Act of Disaster Management (Act Number 24, 2007) also stated that the policies of a BPBD regional disaster management agency should be based on region-specific knowledge and community capacity (Butt, 2014). As a result of the approach by the BPPTKG vulcanology research unit, a volunteer of MMC FM stated that there is some evidence that the Merapi people are more willing to cooperate with the BPPTKG than with the local governments (Mujianto, personal interview, 26 April 2014). As a further result of the tendency to corporate, the community engagement can lead to trust (Steelman et al., 2015, Tang et al., 2012, Harvard Humanitarian Initiative, 2011, Giddens, 1990), as community engagement is one of mechanisms of accountability (Chatfield et al., 2014, Jaeger et al., 2007, Samadhi, 2014, Sandman, 1993).

4.5. The model of reciprocal trust between the local government and the affected community in disaster communication

More importantly, I argue that trust in disaster communication works in a circular interaction between the affected community and the authorities. The government's communication behaviours affect the community's trust; subsequently, the community's communication behaviours that are influenced by its level of trust adversely affect the authorities' trust in the community's capability. If there is a lack of trust, the distrust is more likely to lead to the authorities' reluctance to share control and engage the community in disaster communication. Again, a lack of community engagement and shared-control will be more likely to increase the level of distrust in the authorities (see figure 16).

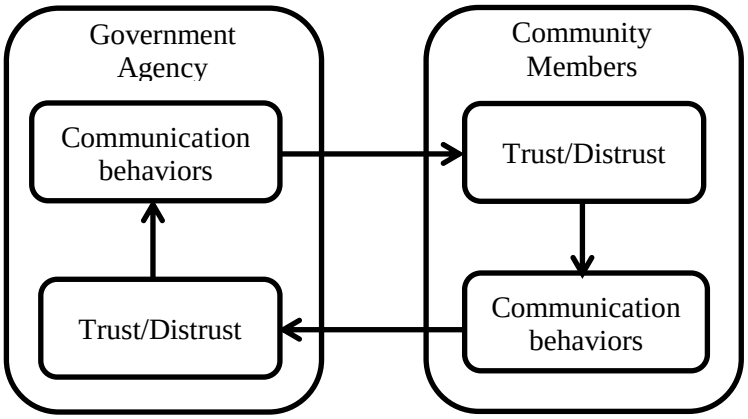


Figure 16. Circular interactions of trust and communication behaviors between community members and authorities.

When the model (Figure 16) is applied in a high trust environment, it is most likely to encourage effective disaster communication. However, when the model is applied in a low-trust environment, perceived uncertainty will increase and the community members will feel less safe; they are likely to express anger and consider the authorities' behaviours to be less appropriate (Sandman et al., 1993). If the official disaster information is not embedded with trust, it will most likely be ignored or responded to slowly (Jaeger et al., 2007, Sandman, 1993) and the uptake of formal information and voluntary co-operation are likely to remain minimal (Fisher, 2013).

4.6. Conclusion

The practice of official disaster communication in the Mt. Merapi surroundings seems more to focus on message construction and media selection to ensure the intended disaster information is well-received by the affected community. Meanwhile, the empirical findings show that the behaviours of disaster communication by the authorities seem to have stronger influences on the perceived trustworthiness of that communication than the message design and the media usage. Hence, addressing the first research question, I argue that the perception of the affected community that official communication is trustworthy and effective is strongly related to the government's promptness in sharing complete official disaster information, and willingness to share control by engaging with the at-risk community, to involve the community's local knowledge and concerns. Additionally, engaging the informal elements of

a community into the formal structure of official disaster communication enables 'creativity and flexibility to sit within a context of continuity and stability' (Griffin et al., 1999; Shannon et al., 2014, p. 649).

In this thesis, I specifically do not take a position on the superiority of either formal disaster communication or informal community-based disaster communication, because both of them have their unique strengths and weaknesses in fulfilling a community's needs for information in disaster response. However, the critiques of an institutional top-down approach of official disaster communication do not seem to be able to be answered by simply changing the top-down approach to the informally bottom-up approach (Meyer and Rowan, 1977). It should not be assumed that government agencies should neglect their ceremonial formal structure in order to promote the efficiency and trustworthiness of disaster communication. Undermining the validity of institutional structures would result in the government agencies most likely not being able to access their formal resources, formally document their practical efficiency, or maintain their stability; more importantly, it would reduce the legitimacy of the agencies (Meyer and Rowan, 1977).

Therefore, it is necessary to look closer at the community level to identify what aspects of a community's social life may be useful in encouraging trust and collective participation in disaster communication. As I argue that the trustworthiness between community members and local government works in a circular interaction, identifying the trustworthy aspects of community communication may be useful to decrease doubt in the government's community-based disaster communication, and, subsequently, increase the degree of trust in the local governments and community engagement in formal disaster communication. Referring to the arguments and the existing studies, community engagement is most likely to increase the community's trust in the government. Further, the reciprocal trust both from community members and the government may lead to trustworthy and participatory disaster communication, which is the key factor to facilitate an effective disaster response (Chatfield et al., 2014).

Chapter 5

Trustworthy community-based disaster communication

Community-based disaster communication is often perceived as untrustworthy because of a combination of excess information, myriad information sources, and a lack of aggregation and validation mechanisms (Gao et al., 2011, Austin et al., 2012, Crowe, 2012, Harvard Humanitarian Initiative, 2011). For similar reasons, the arguments in the previous chapter show that the authorities' excessive reliance on their institutional logic has led to the undermining of perceived trust in community-based disaster communication. Consequently, the community-generated information is often unlikely to be engaged as a reliable information reference in a formal disaster response. In contrast with the authorities' perceptions of the unreliability and untrustworthiness of community-based disaster communication, disaster-affected individuals tend to treat other community members (e.g. families, friends and neighbours) as primary sources of information, particularly in the 48 hours after a disaster strikes (Romo-Murphy et al., 2011). Differently from the authorities' focus on the institutional logic (Lammers, 2011, Thornton and Ocasio, 2008, Meyer and Rowan, 1977), community members often rely heavily on the social capital embedded in their social relationships with other members in appraising the trustworthiness of information (Harvard Humanitarian Initiative, 2011, Jaeger et al., 2007, Putnam, 2000, Tang et al., 2012). Yet, the specific forms of social capital that can encourage trustworthiness and community engagement in disaster communication are still underexplored in the existing research.

Focusing on trustworthy and participatory community-based disaster communication, this chapter identifies the social capital of an affected community that can encourage trust and collective participation in community-based disaster communication. In particular, social capital takes the forms of the engagement of local culture and the tie strength of the local social network. In the case of Jalin Merapi (*Jaringan Informasi Lingkar Merapi* – Information Network of Merapi circle), the engagement was particularly performed by the volunteers of community radio stations who were part of the affected community. At the same time, engaging local culture and involving local actors are the characteristics of community radio stations.

I begin the chapter by explaining the establishment of the Jalin Merapi network by three

community radio stations in the Mt Merapi surroundings, followed by a discussion of the role of community radio stations as a form of community-based disaster communication. The discussion focuses on the characteristics of community radio stations that represent the social capital of the Merapi people, who successfully encouraged trust and community participation in the Jalin Merapi network during the 2010 Merapi eruption. Particular attention will be paid to the significance of the culturally-embedded disaster communication and tie strength of the local social network. In the discussion on culturally-embedded disaster communication, I will discuss the roles of the community radio stations in supporting and reflecting local cultural beliefs in their daily broadcasts, and the implementation of culturally-embedded broadcasting into the Jalin Merapi network. The local culture discussed is discussed in the context of the cultural understanding of Mt. Merapi macrosystem and the relationship between the residents and the volcano as discussed previously in Chapter One. In the discussion on the tie strength of the social network, I will discuss the roles of the tie strength embedded in the personal social network owned by the radio volunteers in information sharing and encouraging trustworthiness in the Jalin Merapi network. Further, I will discuss the internal participatory mechanisms of the community radio stations that encouraged a sense of community among their surrounding community members and led to collective participation in Jalin Merapi, as a community-based network, during the 2010 Merapi eruption. I end this chapter with explanations of the voluntary mechanism and technology platform used by the Jalin Merapi network to facilitate the community participation in its community-based disaster communication.

5.1. Community radio stations: the pioneers of the Jalin Merapi network

Being shaped by communities' prolonged distrust in the official disaster communication as identified in the previous chapter, local disaster understanding and preparedness in terms of the local communication networks aim to establish a reliable communal mechanism that could give them timely, localized, accurate information about Merapi, and simultaneously "bridge" official information in order to be more accessible for the community members. In order to achieve these kinds of aims, Romo-Murphy et al. (2011) stress that a communication mechanism has to be accessible, affordable, and interactive. Since 1998, two-way radio communication has dominated the local community-based disaster communication around Mt Merapi. However, according to a volunteer of Gema Merapi FM (Ferdana, personal interview, 11 March 2014) and a volunteer of Lahara FM (Setyawan, personal interview, 20

March 2014), it is increasingly insufficient because of its limited one-to-one transmission and the high price of a two-way radio set.

Responding to the limitations of the two way radio, *Paguyuban Sabuk Gunung Merapi* (Pasak Merapi – The Association of Merapi's Volcano Belt)[20] introduced three community radio stations in the area surrounding Mt. Merapi in early 2000 and strongly contributed to the development of the Jalin Merapi network. The establishment of community radio stations in the area surrounding Mt. Merapi was based on the practicality and affordability of radio equipment, the accessibility of radio broadcasts, and radio's capacity to maintain two-way communication function. Specifically, Hartanto, a Combine staff member who is also a volunteer of Gema Merapi FM, explained that establishing a community radio station is relatively affordable because it is portable and can be easily constructed only with 50 Watt electric capacity (personal interview, 12 March 2014); this is supported by Fraser and Estrada (2001) who agree that a community radio station technically only requires cheap transistor receivers and low-powered and cheap transmitters. Additionally, a volunteer of K FM described radio as an appropriate medium for the Merapi people, because they have a habit of listening to the radio as their daily communication behavior, particularly when they are working on farms or in mines. He also described that, as an audio medium, radio is suitable for responding to the illiteracy in the area surrounding the Merapi volcano[21]; a community radio station broadcasts audible information and in local languages (Haji, personal interview, 21 March 2014). Another community radio volunteer, Ferdana, expressed his confidence in the accessibility of a radio broadcast because of a high level of mobile phone ownership within the local communities; they can simply listen to the radio through the radio feature that exists in almost all types of mobile phone, even the cheap ones (personal interview, 11 March 2014).

In comparison to two-way radio, Ferdana argued that a radio broadcast is more able to maintain a two-way communication function and to simultaneously extend the information

[20] According to Sukiman, a volunteer of Lintas Merapi FM (personal interview, 6 May 2014) and Wulandari, a community member (personal interview, 7 July 2014), Pasak Merapi is one of the oldest informal community-based organisation that has accompanied the locals in building their disaster capacities since 1997. It has regularly provided various training sessions in disaster management for the community members and assisted the villagers in developing their informal contingency plans. Pasak Merapi has at least 1,860 members distributed in 62 villages in the area surrounding Mt. Merapi.

[21] In the process of my data collection, I observed that some of the elders are still illiterate and only understand the Javanese language. Unfortunately, I could not find the official count of illiteracy in the specific areas of the Merapi volcano. In general, 7.18 percent of the population of the province of thr Special Region of Yogyakarta is still illiterate; similarly, 8.73 percent of population of the province of Central Java is illiterate (BPS, 2013).

coverage from one point to multi-points. A similar argument was also stated by Supadi, a community member:

> The radio is more effective than the HT [two-way radio]. Only certain people have HT. If we turn on a radio during an emergency, everyone can listen to it. HT connects one individual to another. It takes too long! (personal interview, 22 July 2014).

As a result, according to a volunteer of Lintas Merapi FM, Sukiman, the number of community radio stations is growing in the area surrounding Mt Merapi (personal interview, 6 May 2014). There is no official information about their number around Mt. Merapi.

In this case study, I identify that the community radio stations have a strong social responsibility for promoting community capacity in disaster and consider themselves as the local actors of disaster management. Similarly, Barlow (1988), Fraser and Estrada (2001), Moody (2013), Romo-Murphy et al. (2011), and Spence et al. (2009) agree that a community radio station has a greater sense of community responsibility in disasters, compared to other types of radio stations. Specifically in disaster communication, the interviewed community radio volunteers emphasized the important role of the community radio stations as transfer agencies and reliable sources of disaster knowledge/information within the Merapi communities. They regularly insert disaster knowledge about vulcanology and the disaster management of Mt. Merapi in the forms of public service announcements, talk shows, and the local government's disaster programmes. A volunteer of K FM specifically explained:

> We know that Merapi can be a threat, but still we do not want to move away. So we need to develop mitigation, warning, and preparedness. In normal conditions [of Merapi], we keep updating information about its condition and information to build community capacity to adjust to Merapi [...] in the forms of Public Service Announcements and Talkshows [...] It is part of our responsibility to give educated information [...] In an alert situation, we support the information needed. It is compulsory (Asnawi, personal interview, 21 March 2014).

In addition to the informative role, the community radio stations' responsibility for disaster management has also been implemented in off-air programs. Sukiman, a volunteer of Lintas Merapi FM, explained that the community radio stations have been actively involved in various programmes of disaster management and focused on off-air programs in developing community capacity in disaster risk reduction and disaster response by organizing regular training for their surrounding communities. He specifically stated,

> As an organization, we have responsibilities. Not only broadcast, we also educate the communities about disaster risk reduction. The broadcast itself is number two, the most important thing is the off-air events […] about disaster [management] […] So we can be useful for the communities (personal interview, 6 May 2014).

Another community radio volunteer, Mujianto (personal interview, 26 April 2014) added that the community radio stations broadcast local and updated information about Mt. Merapi based on their personal observations of Merapi visualisation. The community radio volunteers regularly climb up to the Merapi peak and river stream for direct observation in order to be able to provide accurate information for the rest of the local community members. After consultation with the BPPTKG vulcanology research unit, the result of the visual observation is broadcast. Moreover, all interviewed community radio volunteers stated that they acted as a mediating group to deliver official disaster information from the authorities, particularly the BPPTKG vulcanology research unit, to the community members. These findings show that the community radio stations undoubtedly consider themselves as having the responsibility for building disaster capacity in responding to a Merapi eruption.

5.2. The establishment of the Jalin Merapi network

Being encouraged by their strong responsibility for local disaster management, all interviewed community radio volunteers claimed that they have developed effective mechanisms for community-based disaster communication for their own community. However, the community radio transmission coverage limits the community benefiting from their community–based disaster communication to those who are geographically located where their signals can be received. In the Indonesian context, Government Regulation No. 51/2005 on Community Broadcasting Enforcement regulates that the broadcasting of a community radio station is allowed to cover areas within a radius of 2.5 kilometres from its transmitter by utilizing a maximum of 50 Watts ERP (Effective Radiated Power)[22]. In addition to the limited coverage, personal media preferences of community members reduce the exposure of a community radio station progressively. Although the broadcast of the community radio stations may travel more than 2.5 kilometres depending on the terrain

[22] As a comparison, the public-service radio station and the private radio station are allowed to reach areas in a radius of 12 to 30 kilometres from their transmitters by utilizing 2 to 63 kiloWatt ERP (Ministerial Decree of the Indonesian Minister of Transportation No.15/2003 on Masterplan of FM Radio Broadcast).

characteristics of its surroundings[23], a volunteer of Gema Merapi FM strongly argued that one community radio station's broadcast is not sufficient to accommodate all community members who require disaster information and should be involved in disaster communication in the area surrounding Mt. Merapi (Ferdana, personal interview, 11 March 2014). If the local communities need to seek information from or share information with those outside the radio coverage, the community radio stations would be insufficient.

In addition to the limited coverage, the community radio stations have had a mutual need for a coordinated and reliable community-generated information network as a solution to the delay in government information. Their awareness of the importance of a communication system that can assist them during a Mt. Merapi eruption was also determined by their spatial vulnerability to Mt. Merapi's hazards (eruption and lahar)[24]. Moreover, the interviewed radio volunteers explained that they have realized that being a single actor was inadequate to establish an effective disaster communication in responding to a Mt. Merapi eruption. It requires observations circling the whole mountain to gain a full understanding of what is really happening in the Merapi volcano. A circular response is also particularly required to address the official disaster response, which is performed separately by different local governments based on government administrative areas; meanwhile, hazards' occurrences do not recognize administrative borderlines.

Responding to the limitation of the community radio stations and the mutual needs for reliable information and a connected circular response, Lintas Merapi FM in Deles hamlet, Siderejo village, Kemalang sub-district (at the south-western part of the Merapi volcano), K FM in Tegalsari hamlet, Dukun village, Dukun sub-district, Magelang district (at the north-eastern part of the Merapi volcano), and MMC FM in Kuncen hamlet, Samiran village, Selo sub-district, Boyolali district (at the north-western part of the Merapi volcano) established the Jalin Merapi network as a community-based information network in 2006. This was clearly described by one of the K FM volunteers below:

> We actually needed each other [...] we had a mutual need for disaster information and shared the same dreams with other radio stations in

[23] For example, K FM's broadcast can cover 7 – 8 villages (out of 372 villages in Magelang district) which consist of approximately 75 hamlets, meanwhile Gema Merapi FM's broadcast can travel three to five kilometres and only cover 8 hamlets (out of 1212 hamlets in Sleman district).

[24] Lintas Merapi FM is located approximately 4 kilometres away at the south-western part from the Merapi summit, MMC FM is located approximately 6 kilometres away at the north-western part from the Merapi summit, and K FM is located approximately 12 kilometres away at the north-eastern part from the Merapi summit.

> Boyolali, Klaten, and Sleman [...] we established the Jalin Merapi network as a medium to share and gather the information [...] Initially, we all had the problems of official information sharing…that needed to be shared with the community [...] It was almost impossible for the community to get any official information because it had to go through long bureaucracy steps [...] Now, if any of the radio stations get official information, it will be quickly shared and broadcasted. It is even faster from the internet (Asnawi, personal interview, 21 March 2014).

The Jalin Merapi network has become a network at the grass-roots level by connecting the community radio stations as the pre–existing communication points in the local communication system in the Merapi volcano area. Sukiman, a volunteer of Lintas Merapi FM, and Nasir, a former Combine staff member, told their stories:

> Jalin Merapi is a network connecting the community radio stations and friends. Our main purpose is to share accurate information about Mt. Merapi (Sukiman, personal interview, 6 May 2014).

> It was good to reinforce the community media, but it was not enough [...] There were a lot of things that could be solved if they were connected to each other [...] The community radios' members had known each other, but there was no bigger coordination [...] Jalin Merapi was a network. It did not interrupt because the communities had their own way [of information sharing] [...] Although, it did not mean that it [the internal information system] was sufficient [...] Actually, the Jalin Merapi network was in the middle. There were communities and community radio stations that worked within them. The Jalin Merapi network was on the upper level of that, connecting the community radio stations surrounding Merapi (Nasir, personal interview, 17 March 2014).

Soon after the establishment of the Jalin Merapi network, the community radio stations could not find the right "formula" to connect all community radio stations in order to form a circular communication process. This was because of the various levels of communication capacity of the community radio stations and the limited supporting communication infrastructure. A volunteer of K FM gave the example that some radio volunteers had difficulties in accessing the Internet and mobile network because these were expensive in 2006, (Haji, personal interview, 21 March 2014). Therefore, the community radio stations collaborated with the Combine Resource Institution (Combine) as the external agency that could assist them in resolving the difficulty with communication technology, particularly the internet-based media. A Combine staff member specifically explained:

> The [disaster] communication and networks between the communities in Mt. Merapi have been established for a long time [...] The community radio stations become the focal points of the communities [...] We [Combine] support the community radio stations and optimize some of their functions with new technologies [...] For example, we developed a SMS Gateway that broadcasted the text messages of villagers on the internet [...] So, the public who are outside Merapi can also read information about Merapi [...] So, we connect the information from the [volunteers of] community radio stations to people outside Mt. Merapi with online media (Wijoyono, personal interview, 17 March 2014).

Combine has played important roles in technology enforcement and assistance for the community radio stations regarding the establishment of the Jalin Merapi network. In addition to the SMS Gateway mentioned by Wijoyono above, Nasir described that Combine also assisted the community radio stations in creating Jalin Merapi's website and, later in the 2010 eruption, Twitter accounts. When this study was conducted in 2014, the website and Twitter accounts of Jalin Merapi were managed by Combine and the community radio stations in such a collaborative scheme.

Later, in the 2010 Merapi eruption, two other community radio stations, Gema Merapi FM in Pagerjurang hamlet, Kepuharjo village, Cangkringan sub-district, Sleman district (the south-eastern part of the Merapi volcano) and Lahara FM in Jumoyo Lor hamlet, Jumoyo village, Salam sub-district, Magelang district (the north-western part of the Merapi volcano), joined the Jalin Merapi network.

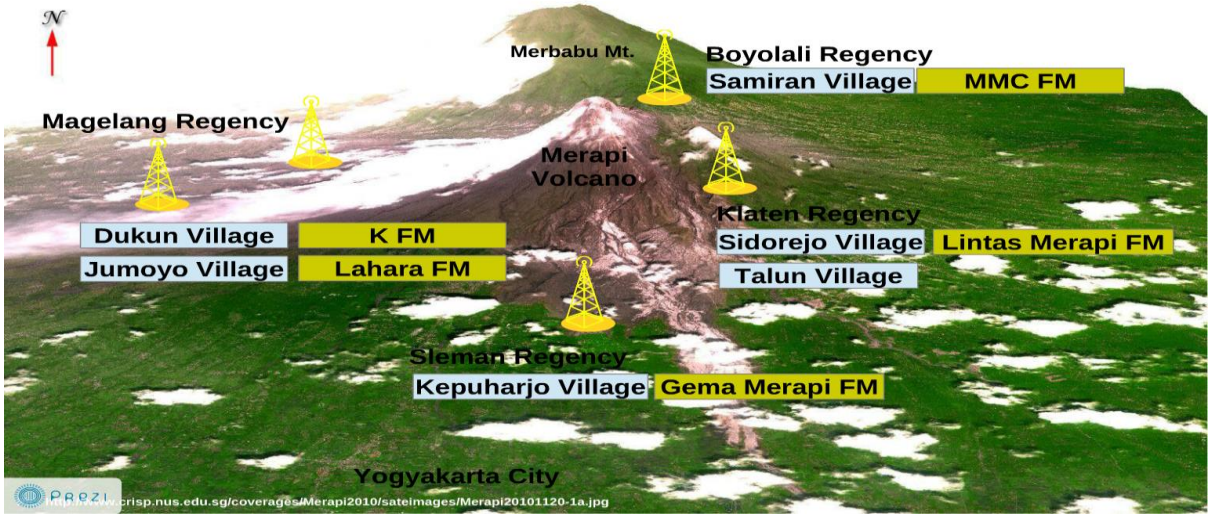


Figure 17. The community radio stations involved in the Jalin Merapi network during the 2010 Merapi eruption (Wijoyono, 2013).

Once the last two radio stations joined the Jalin Merapi network, together they connected all districts to form a circular response on the Merapi slopes. Therefore, the Jalin Merapi network could form a circular compilation of information that represented all districts around the Merapi volcano.

5.3. Community radio stations as a form of trustworthy community-based disaster communication.

The reliability of radio stations in a disaster response is well supported in research, particularly regarding information broadcasting in a local context. However, their roles are somewhat restricted to its function as a form of communication channel (Birowo, 2006, Carpentier et al., 2007, Day, 2009, Fraser and Estrada, 2001) or a personalized communication link (Foy et al., 1992, Mohr, 1992, Moody, 2013, Valenzuela, 1992) that can remain "alive" in an emergency situation. Unfortunately, the broadcasting ability of a community radio station often suddenly disappears right after a disaster occurs (Joyce, 2015). During the 2010 eruption, only two radio stations (Lintas Merapi FM and Lahara FM) were able to broadcast during the emergency situation. Lintas Merapi FM and its community members managed their own IDP camp and transported the radio equipment to the camp, where they continued their on-air broadcast. Unlike Lintas Merapi FM and Lahara FM, the other community radio stations had to be shut down because their radio volunteers had to evacuate and were not able to continue their radio broadcasts while evacuating.

If the roles of community radio stations were limited to being a tool for disaster communication through broadcast they would be automatically ineffective at the time of their inactivity. However, according to the interviewed radio volunteers and community members, the engagement of the community radio stations was considered to be the key factor for trustworthiness and community participation in disaster communication through the Jalin Merapi network. The Jalin Merapi network meant that the community radio volunteers were still able to provide timely local information required by the evacuees and to engage their community members' involvement in the Jalin Merapi network. Despite some scholars arguing that sustainability has been the main strength of radio broadcasts in maintaining information availability during a disaster (Ewart and Dekker, 2013, Moody, 2013, Reynolds and Seeger, 2005), the trustworthiness and participation were not necessarily encouraged by sustainable radio broadcasts because, in fact, three out of five community radio stations that

participated in the Jalin Merapi network were unable to do live broadcast during the 2010 Merapi eruption.

An important observation, then, is that the roles of the community radio stations were not restricted to local information provision in disaster communication using radio technology, but they took advantage of the characteristics of community radio stations that have become embedded in the daily life of the Merapi people. The characteristics are specifically related to cultural engagement and the local social networks owned by its volunteers as local actors. Further, the engagement of the characteristics may develop community capacity to be able to participate in community-based disaster communication, in a familiar and trusted way for the affected community.

5.3.1. Culture-embedded disaster communication as a means of trust encouragement

The literature suggests that community radio stations have the potential to strengthen the internal identity of their community (Birowo, 2006, Carpentier et al., 2007, Day, 2009). This results from limited transmission power that limits the creation of programming to the local content (Lindsay, 1997). In general, all community radio stations in this case study broadcast local content in their on-air programs, about subjects such as the local economy, local culture, education, stockbreeding, agriculture, local tourism, local governance, the environmental conservation of the Mt. Merapi volcano, and any localized activities for community welfare.

As part of the local community, the community radio stations strongly practise cultural identities and local content in their daily radio broadcasts, and these are recognized as one of the main characteristics of community radio stations (Day, 2009, Fraser and Estrada, 2001, Jankowski, 2002, Jurriëns, 2003, Kanayama, 2012, Lindsay, 1997, Moody, 2013, Valenzuela, 1992, Foy et al., 1992, Mohr, 1992). In Indonesia, the practice of localised and cultural radio broadcasting was introduced by Mangkunegara VII, a princely ruler in Surakarta in the province of Central Java, in 1934. He established a radio station to broadcast a live performance of Gamelan music[25] (Lindsay, 1997). The fact that a community radio station is a cultural medium cannot be considered independently of the Indonesian history of radio broadcasting, particularly when the government of the New Order made radio stations the repository of local cultural mediums (Sen, 2003). Further, an alignment of a community radio station with cultural content is regulated in the Government Regulation No. 51/2005, article

[25] Gamelan is one of the Javanese traditional music instruments.

18, clause 2, which states that a community radio station is obligated to broadcast local content in at least 80 percent of all programs. As community media, community radio stations aim at educating and empowering the community by broadcasting cultural, education, and art programs which represent national identities (The Broadcasting Act No.32/2002, clause 21, article 2b; The Government Regulation No. 51/2005, clause 19).

Similarly, cultural characteristics have been embodied within the internal values of the community radio stations which participated in the Jalin Merapi network. The community radio volunteers interviewed for this research emphasized local content as their strength as community media. They particularly design their program content to empower the local traditional culture, in addition to the local economy, agriculture, local governance, local education and disaster management. For example, MMC FM has a regularly broadcast program of Javanese art performances: *Kethoprak, Reog, Baduhi, Kobra Siwo, Jathilan, Rodat,* and *Topeng Ireng*; K FM has regularly broadcast programmes of *Wayangan* (Javanese puppet theatre); and Lintas Merapi FM has a regular live programme of *Karawitan* (Javanese traditional music) performances played by the surrounding community members.

Demonstrating their further commitment to cultural identities, the community radio stations frequently use the Javanese language[26] in their programme content and taglines. For example, the tagline of Lintas Merapi FM is *Nyajiwi Mrih Lestari Merapi* in the Javanese language, which means 'a unity for the sustainable Merapi'. According to Lindsay (1997) and Kitley (2001), the Indonesian government previously required radio broadcasts to use *Bahasa Indonesia* as the national language to suppress regional and ethnic differences. However, the use of the local language is now legally permitted to support cultural programmes (the Government Regulation No. 51/2005 clause 21 article 2). This use has successfully established audiences' familiarity with the radio stations, as explained by a volunteer of K FM below:

> Actually, K FM means Key FM [...] A unifying key [and] a key of information [...] Our tagline was "Key FM, it's your community channel"…then we regretted using English [...] because the community apparently did not understand it [...] In 2007, we changed it to be "*Gawe Adem Lan Ayem*" [to make it seem cool and relaxed]. It is in the local language [...] Although it may sound weird for the outsiders, it sounds familiar to the locals *(*Haji, personal interview, 21 March 2014*).*

[26] In a cultural context, Indonesia has more than 300 ethnic groups with more than 700 languages and dialects (Dougall et al., 2008; Troll et al., 2015).

Being constructed by cultural identities and local content, the community radio stations do not only broadcast their cultural program to entertain their listeners. They also have designed their cultural programs, which are broadcasted in the Javanese language, to combine cultural content with disaster content in order to fulfil their social responsibility in disaster management. For example, Gema Merapi FM combines culture and disaster risk reduction as its tagline:

> At first, our tagline was "*Berbudaya dan Tetap siaga*" ["Be cultural and be alert"], now we added "*Berdaya*" ["empowered"]. So, it becomes "Be empowered, be cultural, and be alert". It represents our content of broadcast that focuses on culture and Merapi preparedness. The term of "empowerment" refers to our independence [...] We hope that our community radio station can empower the locals [...] particularly after they lost their livelihood during the 2010 Merapi eruption [...] So they can be empowered, be cultural and keep being alert for the Merapi hazard (Ferdana, personal interview, 11 March 2014).

Another example is the radio-based disaster mitigation messages in a cultural format called Disaster Management Audio Material (DMAM), which has been developed by all involved community radio stations in the Jalin Merapi network. Lintas Merapi FM created Javanese comic chats, Javanese songs, and *Wayangan* (Javanese puppet theatre) about early warnings of Mt. Merapi eruptions.

The particular culture-embedded approach is appropriate for the local communities living on the slopes of Mt. Merapi who have been strongly influenced by their Javanese culture in perceiving the volcanic risk and personifying Mr. Merapi in their daily life. Yet, it is important to acknowledge that degrees of cultural belief and risk perception vary in the local communities living on Mt. Merapi's slopes. Similarly to Donovan et al. (2012), I identified that risk perception and the degree of cultural belief are different within the local communities based on their geographical locations or their proximity to volcanic hazards. The local communities on the lower parts of Mt. Merapi's slopes, who are relatively distant from volcanic hazards, seem to have higher risk perceptions, in comparison to those living in the higher parts. Supadi, a community member who lives only four kilometres away from the Merapi summit, argued that the community members on the higher parts of Mt. Merapi's slopes have better disaster knowledge and are more willing to be involved in training for disaster management. He specifically stated:

> We understand about the phreatic eruption [...] When it happened, the lower people were uncontrollable [...] They panicked and evacuated! We did not go anywhere but cleaned up the dirty roads [...] because of the volcanic ash [...] We have a better understanding about Merapi [...] when we had to evacuate, the evacuation barracks were full of the lower people [...] We realize that we need the knowledge (and) we can get it through training.

Nonetheless, Lavigne et al. (2008) found that they are more affected by cultural beliefs than the communities who live on the lower part of Mt. Merapi's slopes. Sukiman, a volunteer of Lintas Merapi FM who lives four kilometres away from the Merapi summit, agreed that the Merapi people still need to keep harnessing their local "senses" in observing the Merapi volcano, in order to complement the official information from the BPPTKG volcano research unit (personal interview, 6 May 2014). Consequently, the communities on the lower slopes of Mt. Merapi were more likely to evacuate than those on the higher slopes (Donovan et al., 2012). Again, this supports the argument that the local cultural beliefs still have a dominant influence on the risk perception and disaster behaviors of the local communities, regardless of their scientific disaster knowledge.

Referring to the significant influences of cultural beliefs in risk perception and evacuation decisions, the community radio volunteers interviewed strongly encouraged cultural engagement in their disaster information[27]. They emphasized the importance of recognizing communication behavior, and particularly the role of the local language as part of the communal identities in a local context, in disaster communication. Specifically, a volunteer of Lintas Merapi FM argued that the effectiveness of disaster-related messages is significantly influenced by the local culture and communication behavior (Sukiman, personal interview, 6 May 2014). In practice, the community radio volunteers provided their disaster information to the Jalin Merapi network in the Javanese language during the 2010 Merapi eruption. Consequently, the disaster information provided in the local language was considered to be able to facilitate familiarity, increase the level of understanding, and avoid misunderstanding by the affected communities; this was clearly explained by an interviewed community member:

[27] Defining culture is 'almost unfeasibly difficult', because it involves all aspects of an individual's life (Crang, 1998). Specifically, the socio-cultural factors in this thesis refer to the definition of Bankoff et al., (2015), p. 5 as the 'beliefs, attitudes, feelings, experiences, values and narratives, and their associated behaviors, actions, and day-to-day routines' shared by the local communities living on the slopes of Mt. Merapi, with regard to the volcanic hazards of Mt. Merapi.

> Communicate with us with our language [...] use our local media [...] in a very local way [...] Because of the usage of local language and local content, they can "speak" to community members in such a way that can be easily understood by the community members (Wulandari, personal interview, 7 July 2014).

The argument that using the local language facilitates effective information sharing for the familiarity it creates mirrors the studies of Berque (1992) and Valenzuela (1992) that identify an engagement of local language as a key factor for mutual understanding because community members tend to identify themselves with it. Furthermore, information from the Jalin Merapi network was most likely to be accepted by the Merapi people, because it could "bridge" the information they needed in convenient ways based upon their daily communication behaviors.

In addition to using the Javanese language, the community radio volunteers underlined the need to comprehend the local wisdom with scientific knowledge by applying a culturally rational approach; although this does not necessarily mean that the message design has to blindly take sides with cultural beliefs. Taking the evacuation instruction as an example, Mujianto, a volunteer of MMC FM, argued that local beliefs can be engaged in providing rational information about Mt. Merapi's hazards. He further explained that they composed the evacuation instructions based on the "need" of Mt. Merapi for "extra workspace" to improve its nature for the benefit of local communities. He specifically stated:

> It has been difficult to evacuate the villagers. We are in Selo [sub-district] located on the back side of Mt. Merapi. It's impossible if the Mt. Merapi spews out its material into Selo [...] [However], its nature is unpredictable. So, together with the other [volunteers of] community radio stations, we have been trying to build awareness of the nature of Mt. Merapi. We have to share our "time" and "space" with Mt. Merapi. When Mt. Merapi needs to use "our shared space", we have to give it entirely to Mt. Merapi [...] So, we don't use the word "evacuating", it's our awareness to voluntarily give our "time" and "space" to Mt. Merapi, so it will be able to "work" in its natural being (personal interview, 26 April 2014)

This approach is in contrast to the way the local government designs their evacuation instructions based on scientific explanations of Mt. Merapi. However, the approach was more likely to successfully convince the affected community to evacuate because it fitted their cultural wisdom to live in harmony with nature and their geomythologies, perceiving that Mt. Merapi had power over their lives and should be treated respectfully (Triyoga, 2010).

Likewise, this approach is actually in line with scientific rationale as Mt. Merapi will erupt volcanic materials, which will fertilize the soil and provide the local communities with more material for mining.

The tendency of a community to absorb a scientific explanation into their traditional culture can be observed in the case of Mbah Maridjan. After his death in the first eruption in 2010, there seemed to be a shift of trust within the Merapi communities towards the local government and vulcanology experts as the new "gatekeepers" of Merapi Bachtiar (2014), particularly Surono as the Head of the Geology Agency during the 2010 eruption. Unlike Mbah Maridjan, Surono gave scientific explanations of the 2010 Merapi eruption by monitoring the Merapi observatory points and seismograph. Despite his scientific approach, the Merapi people gave the cultural appellation "Mbah" to Surono, instead of "Sir", the regular appellation for officials. This was an attempt to fit him into their cultural belief, as they normally entrusted the understanding of Merapi to the elders who are trusted as wise people. However, the shift has not necessarily applied to all Merapi people. When this study was conducted in 2014, many community members still complied with their cultural and religious informal leaders in making a decision to evacuate rather than the officials; this was clearly stated by an interviewed community member:

> The locals, particularly the elders have [...] a spiritual leader [...] his name is Mbah Gini [...] Many villagers believe that he can communicate with Mt. Merapi [...] How? I don't know. If he says that the villagers have to go down [evacuate], they go down. He's like Mbah Maridjan (Setiyoko, personal interview, 8 July 2014).

Yet, the engagement of cultural rationality has been rarely applied by the authorities in official disaster communication (I have discussed how the local governments have heavily relied on the scientific principles in disaster management in Chapter Four). The most common argument about the unlikeliness of cultural rationality engagement in disaster management is because the inherent cultural knowledge may be unacknowledged or perceived as irrational or unnecessary by outsiders (Ropeik and Gray, 2002, Sandman, 1993, Bankoff et al., 2015). In fact, not all cultural beliefs owned by the Merapi people are unaligned with scientific rationality. For example, when the crops die because of volcanic ash, the Merapi people believe that it is the time when the Merapi kingdom borrows their crops for its party and it will return their crops abundantly in the next harvest time. Also, the Merapi people believe that they have to stay at home when Mt. Merapi releases volcanic ash,

because it is taboo to watch the spirits while they are working to transport their crops to the Merapi kingdom. This logic makes sense as when the volcanic ash mixes with soil, it will fertilise the soil. Also, avoiding the dangerous volcanic ash by hiding in the houses makes sense medically (Triyoga, 1991). Again, the Merapi people also believed that their houses have to face the road; the houses cannot face the Mt. Merapi, as it is considered to be disrespectful to Mt. Merapi and a surrender to giving the house as a 'nest' for the spirit in the Merapi kingdom. This also makes sense as the position of the houses will make them easier to evacuate during an eruption (Triyoga, 1991, pp. 73, 123). In a similar fashion, Bankoff et al. (2015, p. 9), Lavigne et al. (2008) and Sandman (1993) describe that public perception based on 'cultural rationality' makes perfect sense for those who experience it personally; in a similar way to 'technical rationality', it also has the subjectivity of external reality. However, the distinction depends on which aspects of reality one perceives.

Likewise, adopting the local geomyths in disaster communication can make disaster information more understandable for all levels of the local community, compared to the scientific explanation, because it can contextualise the knowledge in daily life. This can be exemplified by how the traditional knowledge in the local geomyths has been passed from generation to generation easily. According to Troll et al. (2015, p. 141), the non-scientific 'geological' imagery, such the cultural personification of Mt. Merapi, is more accessible to the local community because it can provide a clear concept of the relationship between the natural events of Mt. Merapi and their social life. Yet, my argument does not necessarily suggest negating the science rationality in disaster communication, but more to emphasize that disaster communication can more effectively reach the affected community when it is designed in a psychologically familiar approach for the affected community.

Additionally, I argue that the engagement of culture is more likely to encourage trust within the affected community. Julianto, a community member, clearly stated, 'the engagement of local wisdom was one of the determining factors in maintaining trust' (personal interview, 8 July 2014). In practice, the Merapi people tend to feel that disaster information is trustworthy when it comes from someone who is "part of us". This finding also has another implication in strengthening the argument that engaging the affected community as the local actors is important, because of their understanding of local perspectives (Day, 2009; Fraser & Estrada, 2001; Moody, 2013).

Culturally-embedded disaster communication does not only potentially encourage trust within the affected community, but may further become a means of establishing trust in its authenticity in providing and sharing Merapi-based information among the wider audiences of the Jalin Merapi network. In his interview, Nasir, a former Combine staff member who was also located at the main post of the Jalin Merapi network after the eruption started, gave an example as below:

> My first tweet was derived from the Facebook status of a community radio volunteer. Sukiman [Lintas Merapi FM] always uses the Javanese language [on his Facebook status]. I copied and tweeted it. My second tweet was its translation [...] There were some tweets that mentioned that it was interesting because it was different and directly came from the locals in the Javanese language [...] They even recommended that Jalin Merapi published real information from the locals of Merapi (17 March 2014).

The argument that the usage of the Javanese language on social media encourages trust mirrors the study of Crowe (2012) regarding the significant role of cultural identity in validating information on social media. However, it is also important to acknowledge that the process of translation, from the local language to another comprehensible language for the outsiders, requires extra time that may delay information sharing (Harvard Humanitarian Initiative, 2011).

In summary, culturally-embedded communication that is performed by the affected community potentially becomes an effective means of increasing the effectiveness of disaster information and establishing trust. This contrasts with previous studies on the negative effects of cultural beliefs on risk perception (Butt, 2014, Donovan, 2010, Donovan et al., 2012, Dove, 2008, Lavigne et al., 2008, Schlehe, 1996), and the lack of socio-cultural acknowledgment in crisis communication theories and practices (Fronz, 2012, Hewitt, 1983). The argument, however, supports the previous studies in regard to their arguments about the positive association between cultural values and trust (Guion et al., 2007, Romo-Murphy et al., 2011, Veszteg et al., 2015, Uslaner, 1999, Widén-Wulff et al., 2008), as homophily ('sharing the cultural values of your audience and showing that you share them') is one of the determining factors of public perception of an information source's credibility (Sandman, 1993, p. 69). Moreover, culturally-embedded communication can positively facilitate a common understanding of collective goals, which further lead to grass-roots collective participation (IFRC, 2015, Murayama et al., 2013, Samadhi, 2014, Tang et al., 2012). On the other hand, neglecting cultural understanding may lead to high levels of distrust and low

levels of linking social capital; further, it prevents co-operation and the community members will remain unlikely to act on information accordingly (Fisher, 2013).

The argument that culturally-embedded communication encourages effectiveness and trust in disaster communication is strengthening the previous argument about the importance of integrating socio-cultural knowledge in the official assessment of disaster management (in Chapter Four). Culturally-embedded communication, in the form of local language use and culturally-rational message design, can overcome the incompatibility between some cultural beliefs and a scientific approach that is often applied in formal disaster management. The approach can particularly translate scientifically technical disaster-related information in order to adapt it to public understanding (Nisbet & Scheufele, 2009; Reynolds & Seeger, 2005). Again, engaging local traditions in disaster communication can provide potential linguistic tools to 'introduce a dialogue' and facilitate 'a fruitful interaction' between the outsiders, who rely on scientific grounds, and the affected community, who rely on cultural beliefs (Troll et al., 2015, p. 138, 161). Similarly, Bankoff et al. (2015), Dove (2008), Mei et al. (2013), Shannon et al. (2014), Triyoga (1991), and the Sendai Framework of the United Nations (2015) agree that combining traditional values and scientifically rational responses can create useful hybrid forms of disaster management.

5.3.2. Networks of local actors in community-based disaster communication

In order to facilitate effectiveness in information sharing, and encourage trust and participation from the affected community, I argue that disaster communication needs to engage the local social networks, the ones with both strong ties and weak ties. This argument is built on the finding that Jalin Merapi was able to achieve the positive outcomes above by being a manifest practice from a community-based movement and a systematization of the existing local network of the involved community radio volunteers, as described by a community member:

> Jalin Merapi is an iceberg phenomenon [...] The initiative [of Jalin Merapi] cannot be separated from the community radio stations [...] It would be meaningless without the previous disaster experiences and the community-based networks [...] In my opinion, Jalin Merapi was a descendant of the movement of community-based information networks. The main instruments were the community radio stations [...] The pre-existing network had been established, but they were not connected with each other

> yet [...] Jalin Merapi connected them [...] We can't see Jalin Merapi as Jalin Merapi itself [...] Jalin Merapi will be nothing without the community radio stations [...] So, the pre-conditions of Jalin Merapi had been established over such a long time, not in a short time (Zakaria, personal interview, 27 June 2014).

Similarly, Sukiman, a volunteer of Lintas Merapi FM, and Wijoyono, a Combine staff member, strongly emphasised:

> Jalin Merapi significantly required the community radio stations for their actors and networks. Otherwise, it would not have been able to engage the community members during the 2010 Merapi eruption […] I urge people not to trust "Jalin Merapi", trust "the actors of Jalin Merapi" instead [...] It is closely related with the roles of the community radio stations in the area surrounding Mt. Merapi [...] In the absence of the [volunteers of] community radio, I think people will not trust Jalin Merapi as much as they did [in the 2010 eruption] [...] Jalin Merapi is the community radio stations. The radio stations are the community members themselves (Sukiman, personal interview, 6 May 2014).

> Jalin Merapi is a medium established on the pre-existing community network. The pre-condition is the agreement of a mutual need [in the pre-existing network]. It is followed by the medium (Wijoyono, personal interview, 17 March 2014).

By engaging the community radio stations, Jalin Merapi became a network at the grass-roots level by connecting the existing communication points within the local communication system on the Merapi volcano. According to a former Combine staff member, Nasir, Jalin Merapi's system would not work if there were no existing networks that could be connected (Nasir, personal interview, 17 March 2014). Confirming Nasir, a volunteer of Jalin Merapi told the story of when they failed to apply the model of the Jalin Merapi network in a different disaster because of the absence of local social networks:

> We copied the model of Jalin Merapi into the flood of Jakarta in 2013, last year [...] We used the Twitter @kalamkata [...] It suffered from the absence of local verification [...] We had no one in the field [...] no one acted like the [volunteers of] community radio stations in Jalin Merapi [...] If we personify it as a soccer match, the volunteers of the community radio stations passed the ball, and the Twitter account became the striker. It didn't work that way [in the 2013 Jakarta flood] [...] There was no engagement of [volunteers of] community radio stations who were the locals and the existing actors of local disaster management at the community level [...] I was really

> disappointed [...] But, the model of Jalin Merapi was applied successfully in the Mt. Kelud eruption [...] because we also engaged the community radio stations there (Negoro, personal interview, 23 April 2014).

Dougall et al. (2008), Hilhorst and Serrano (2010), Richards (2010), and Shannon et al. (2014) agree that engaging local actors within ongoing and local relationships with mutual goals will result in more effective disaster communication and humanitarian activities, compared to those without any pre-existing relationship. Therefore, this particular section's focus is on the way the tie strength of the social network of the community radio volunteers influences information sharing and trust encouragement in disaster communication.

5.3.2.1 The roles of strong ties in information sharing and trust encouragement.

During a disaster response, humanitarian volunteers, who mostly come from unaffected communities, often face barriers in gaining instant access to disaster-affected evacuees (Borgatti and Halgin, 2011, Harvard Humanitarian Initiative, 2011, Murayama et al., 2013, IFRC, 2015), in order to gain information directly from them. They usually do not understand the local culture and local language, and do not have personal relationships with the evacuees in order to make an appropriate approach. Although recent disasters demonstrate that affected communities have increasingly utilized internet-based media, especially social media, to request specific assistance (Austin et al., 2012, Palen, 2008, BBC, 2012, Doan et al., 2012, Lindsay, 2011), this cannot necessarily be generalized to a community that is heavily influenced by local culture such the Merapi community. During the 2010 Merapi eruption, some of the interviewed community members stated their hesitation in sharing information about their needs with strangers, particularly on social media, and considered that it was culturally inappropriate (Purnomo, personal interview, 8 July 2014). Similarly, they also hesitated to request help from the local government because of the complicated bureaucracy (Adji, personal interview, 22 July 2014). Not only were they hesitant to talk about their personal disaster information, but the Merapi people also tended to avoid talking about the eruption they were facing. They culturally believe that it is taboo to talk about an eruption because the erupted volcanic material is regarded as a working spirit that gets angry if it is being talked about; any violation of the taboo will lead to death (Triyoga, 1991). Based on the finding that the affected community hesitated to share their information to strangers, I argue that the local traditional culture has a stronger influence on the affected community's effort to seek out resources (aid, in this case) from their network ties, regardless that the novel communication technologies offer ease of connection with someone outside their close social

network. The culturally-influenced hesitation of the Merapi people in sharing disaster information with strangers tends to widen the gap between the evacuees and outsiders; yet the outsiders are those who are more likely to be able to provide aid for the affected community when the supporting systems are extremely damaged.

This thesis demonstrates that the strong ties embedded in the close personal relationships between the community radio volunteers, who are members of the affected communities, and the evacuees played a significant role in encouraging the evacuees to share their personal disaster information. Unlike the hesitation in sharing disaster information with strangers, some evacuees did not feel ashamed or hesitant in sharing their personal disaster information with the community radio volunteers, because of their personal familiarity with these volunteers based on common community membership and geographical proximity; this was clearly stated by Setiyoko, a community member, 'because we know each other […] we share our information' (personal interview, 8 July 2014). Moreover, the community radio volunteers understood better how to approach the fragile evacuees culturally and linguistically in order to gather information and engage them in disaster communication. Another community member, Adji, agreed that it was more convenient to share their information in such a daily conversation with the community radio volunteers as unlike communicating with the local government, it did not require any formal administrative requirement. He also stated, 'It was easy and quick, because we know them' (personal interview, 22 July 2014). The argument that the community radio volunteers, who were part of the affected community, with a strongly tied social network can facilitate information gathering within the affected community is similar to that of Opsahl et al. (2010), Putnam (1993, 2000), and Uslaner (1999) who also argued that strongly-tied individuals are effective in facilitating internal information diffusion. Similarly, Haythornthwaite (2005) and Romo-Murphy et al. (2011) agree that the values of interpersonal relationships between strongly-tied individuals can encourage a willingness to collaborate in exchanging information.

Not only can they bring effectiveness into the process of information gathering from the affected community, but a social network of strong ties can also bring effectiveness into the process of information sharing from the people outside the affected areas to the affected community. This argument is particularly significant in responding to the lack of direct communication with the affected community in official disaster communication, which was previously identified in Chapter Four. In the Jalin Merapi network, the involvement of the volunteers of community radio stations in the Jalin Merapi network could provide an

appropriate mechanism to deliver information directly to the affected community members by engaging information nodes that are internally recognized and considered to be reliable by the community members. Specifically, Sukiman, a volunteer of Lintas Merapi FM, described that the community radio volunteers could identify who talks to whom, about what, via which media, and media accessibility on a regular basis (personal interview, 6 May 2014). The community radio volunteers also could identify the existing key influencers who play important roles in information sharing and can mobilize other community members. The ability of community radio volunteers to increase information through their networks mirrors the studies of Hindman and Coyle (1999) and Kanayama (2012).

The effectiveness of engaging strongly-tied individuals in sharing information within the affected community was also acknowledged by a community member. He specifically stated:

> It's confusing if we don't know who is sharing information with us [...] Firstly, we have to know who they are [...] Those who share information have to be familiar with those with whom information is being shared [...] the community members and the community leaders [...] There should be a connection beforehand [...] a personal closeness (Julianto, personal interview, 8 July 2014).

Instead of trying to reach all community members, the particular knowledge of local social networks can provide effectiveness by recognizing who can act as information nodes in representing collective information from the community members, and extending exposure of disaster information to the rest of the community members. This way was also acknowledged by Setiyoko, a community member, as a way that can facilitate effective and trustworthy information sharing within the community members. He specifically stated:

> We can identify someone as the representative of a hamlet [...] he will share the information to the rest of the community members [...] It may be very effective because it can speed up the information sharing. Who is the information source is also clear [...] because we know him [...] it is more trustworthy (personal interview, 8 July 2014).

Similarly, Austin et al. (2012), Harvard Humanitarian Initiative (2011), Lavigne et al. (2008), Shannon et al. (2014), and Steelman et al. (2015) agree that the key influencers of an affected community have to be carefully identified and engaged in user-generated content sharing. Without the knowledge of 'inside' contacts, outsiders might choose the 'incorrect' information sources with inappropriate network ties (Borgatti & Halgin, 2011, p. 1169) and this certainly results in ineffective disaster communication.

In addition to the argument that strongly-tied local actors play important roles in internal information sharing within the affected community, I also argue that the consistent engagement of strongly-tied local networks can provide a perception of a guarantee of the validity of information that was being shared within the particular networks, which further leads to trust. The argument is supported by six out of the eleven interviewed audiences of Jalin Merapi, who argued that it was mostly the involvement of the local actors whose personal relationships/networks led to trust based on personal recognition. Further, the personal recognition provides clarity of information sources, so the information is considered trustworthy and reliable. A community member, Julianto, clearly stated, 'based on our culture, we trust more in someone we know' (personal interview, 8 July 2014). Similarly, another interviewed community member stated, 'People prefer someone whom they know personally as a trustworthy information source [...] because they are more accurate' (Wulandari, personal interview, 7 July 2014). In particular, another community member, Supadi, described his trust in the community radio stations:

> We trust the information shared by the community radio stations [...] it is as accurate as the official information shared by the village government [...] The difference between them lies in its speed [...] the one [the information shared by the community radio stations] is fast, the other one is slow [...] We trust the information shared by the community radio stations [...] it's accurate for sure (Supadi, personal interview, 22 July 2014).

In his interview, Haji, a volunteer of K FM, expressed his agreement:

> I personally trusted our volunteers [...] I do not reckon the media, but I 100% trust all information from them [...] If someone informed about a condition of a particular area in Merapi, all we needed to do was to chat with the community radio volunteers who lived in that area, and ask them about the information's accuracy. If they said that it was not true, I would not have shared it (personal interview, 21 March 2014).

The argument that the involvement of strongly-tied individuals provides trust in disaster communication is similar to previous studies (Bouchillon, 2014, Opsahl et al., 2010, Putnam, 1993, Sias and Wyers, 2001, Uslaner, 1999, Murayama et al., 2013, Fisher, 2013, Haythornthwaite, 2005, Putnam, 2000) that argue the positive association between strong ties and trust.

Yet, although the strong ties may effectively encourage "inside" information sharing, they seemed to be another barrier to sharing their information with outsiders. Some interviewees

seemed to show a tendency for 'amoral familism' which demonstrates a high number of strong ties and a low number of weak ties (Widén-Wulff et al., 2008, pp. 351-352). They specifically perceived that the involvement of some outsiders did not assist them to gain accurate information about Mt. Merapi, but was more likely to create confusion. Supadi, a community member (personal information, 22 July 2014), clearly stated: 'Those who are not locals, they mostly exaggerate the information. For instance, when someone asks A, they answer B'. This also may lead to an egocentric network as raised by Fisher (2013) and Granovetter (1973). Consequently, the community members tend to restrain themselves from networking and communicating with people outside their own community and this may prevent the insiders' information from being shared with the outsiders, and the other way around.

5.3.2.2.The roles of weak ties in information sharing and trust encouragement

With regard to the possibility of an egocentric network, the community radio volunteers acted as information couriers by actively gathering information at the individual level in the IDP camps and shared it further with wider audiences through the Jalin Merapi network. During the 2010 eruption, most of the evacuees did not closely know the Jalin Merapi network. They mostly recognized the Jalin Merapi network was closely related to their community radio stations; this was clearly stated by an interviewed community member:

> When we experienced the 2010 eruption, Jalin Merapi helped us to get what we needed. The community radio station was the one that facilitated the process [...] We know that Jalin Merapi is closely related to our community radio station [...] Sukiman [Lintas Merapi FM] personally introduced us to Jalin Merapi (Supadi, personal interview, 22 July 2014).

In practice, Jalin Merapi engaged internet-based media (e.g. social media, website, and audio streaming) to virtually share the information provided by the Merapi people with wider audiences, who were located beyond the broadcasting coverage of the involved community radio stations. Similarly, Birowo (2006), Fraser and Estrada (2001), and Hindman and Coyle (1999) agree that integrating community radio stations with the internet is one of the best ways to reach out to wider audiences whilst maintaining two-way communication.

Based on the finding, I argue that weak ties can bridge information sharing between the affected community and the people outside the affected areas in disaster communication (see Figure 19). By engaging the internet-based media, particularly social media, Jalin Merapi

generated weak ties of social network by virtually extending the existing offline social networks of the affected community to the people outside the affected areas; this ability of social media has also been identified in previous studies (Schellong, 2007, Austin et al., 2012, IFRC, 2015). Simultaneously, Jalin Merapi networked the "dots" of otherwise disconnected information nodes consisting of the evacuees, potential donors, and authorities; this was clearly explained by Zakaria, a community member, as below:

> The technologies helped. But the most important thing was the network establishment. So, there were two things: [1] Twitter, SMS, email were the technologies. [2] Jalin Merapi was an initiative to establish the network among the donors, those who distribute the aid, and the beneficiaries. It made the process more effective and faster. Donors usually don't know the locations of the affected areas. [Thus], overloaded aid in a particular area becomes a common problem in many disasters. Jalin Merapi had the technologies and the network. In my opinion, the most important part of Jalin Merapi was the network. It made a new connection between the victims and those who want to help, with Jalin Merapi as a mediator. The information was distributed evenly and clearly. There was no buildup [of information] (personal interview, 27 June 2014).

The argument about the weak ties established by social media fits the latent tie theory of Haythornthwaite (2005). The usage of the communication platforms (Twitter, in this case), which were previously not used by the community radio volunteers, can connect individuals who had been disconnected socially through latent social network ties. Further, the combination of online 'technical connection' mediated by the social media and the 'social interventions' of the Jalin Merapi network in providing and sharing information through Jalin Merapi's social media channels were most likely to develop the latent ties between the Jalin Merapi network and the people outside the affected areas into weak ties (Haythornthwaite, 2005, p. 140). Furthermore, the generated weak ties bridged information from the affected community to the people outside the affected areas and vice-versa.

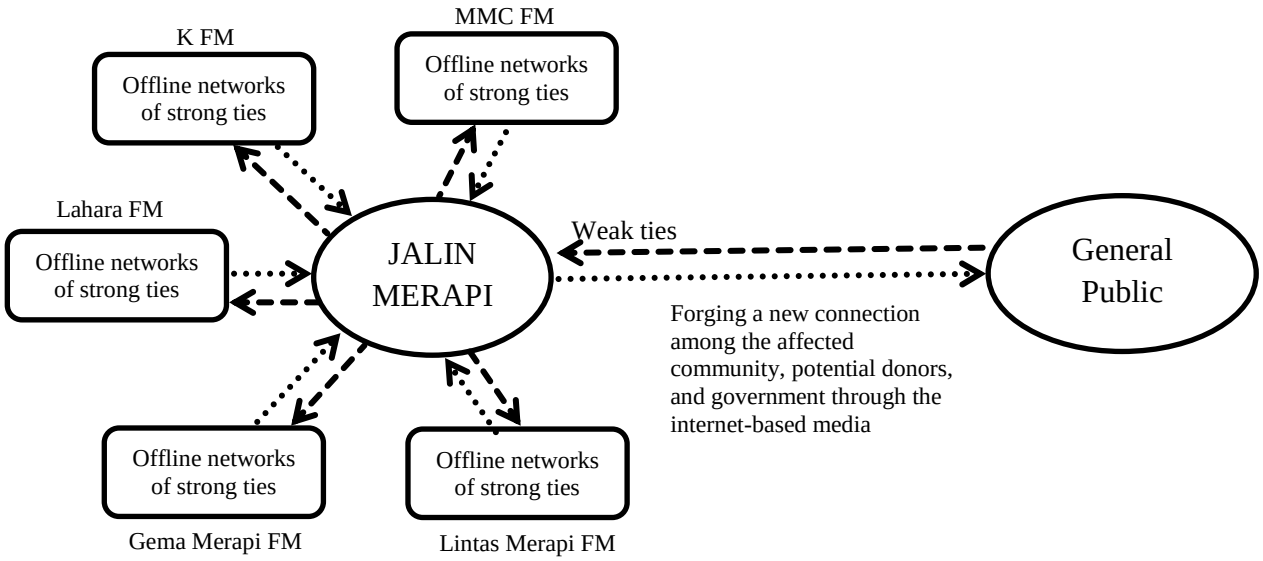


Figure 18. Tie strength in Jalin Merapi's disaster communication

The argument that weak ties play important role in sharing information between different communities supports the previous studies (Fisher, 2013, Lin, 2001, Widén-Wulff et al., 2008, Granovetter, 1973, Valente and Fujimoto, 2010, Hansen, 1999) showing the important roles of weak ties in external information diffusion. Not only have they enabled the affected community to share their information with the outsiders, but weak ties also enable them to gain new information/ resources from those who are beyond an individual's close-community network (Lin, 2001, Johnson, 2007, Granovetter, 1973, Borgatti and Halgin, 2011, Montgomery, 1993). Furthermore, new information/resources can potentially play important roles in community and individual empowerment (Fisher, 2013), particularly in assisting them to be resilient in a disaster response.

In addition to the benefit of weak ties in external information sharing, I argue that weak ties encourage trust indirectly for the people outside the affected areas. Not only have they extended the social network of the affected community, but the weak ties also indirectly extended trust that had been established by the strong ties of the Merapi people. In practice, trust embedded in the strong ties of Merapi people led to personal recommendations on Jalin Merapi's trustworthiness within their extended networks (the weak ties). This was clearly explained by Zakaria, a community member who acted as a donor during the 2010 Merapi eruption, as below:

> Whom I knew in Jalin Merapi's network mattered. I didn't need to verify. So, the network was the most important thing [...] I didn't notice who the

> evacuees were anymore. I was confident that the information from Jalin Merapi was valid [...] because it was based on my friend's recommendation…even my friend's friend [...] Conversely, my friends didn't need to verify who Jalin Merapi was; the most important was my recommendation about Jalin Merapi [...] So, it was more a friendship network (personal interview, 27 June 2014).

From the perspective of the people outside the affected areas, trust in the Jalin Merapi network was particularly related to the fact that it directly engaged the strongly-tied community radio volunteers, who were part of the affected community and able to provide information about the real conditions and needs of the evacuees. This also appeared to affect potential donors in deciding the reliability of the Jalin Merapi network in distributing their donations, as Jalin Merapi was able to deliver specific aid to the specific evacuee who requested it, not to representatives of the evacuees. The trust for aid distribution was described by one of Jalin Merapi donors as below:

> I preferred to give my donation to Jalin Merapi [...] rather than to the mutual donation account that was created by my company [...] Jalin Merapi could directly deliver my donation [to the evacuees]. My company could not give a quick response [...] [It] waited until a certain date [...] then chose another agency [to distribute the donations] [...] I did not know exactly when it was delivered [to the evacuees] (Ramawanti, personal interview, 24 July 2014)

The argument that weak ties indirectly encourage trust mirrors the study of Bouchillon (2014) that weak ties do not have a direct effect on trust establishment, but are more likely to have an indirect or extended effect that was initiated by the strong ties of the affected community.

Regardless of the positive outcomes of extended relationships and extended trust, I argue that the online social network of weak ties does not automatically provide a sustainable trustworthy disaster communication because of its foundation on an unstable latent network; the instability of weak ties also has been acknowledged by Bouchillon (2014) and Widén-Wulff et al. (2008). In the case of Jalin Merapi, the social network of weak ties could vanish easily because it strongly depends on the social media used to bridge different communities and the shared interest in a temporary volcanic eruption. One of the administrators of Jalin Merapi's Twitter account, Wijoyono expressed concern regarding the difficulty in maintaining active interactions and active followers on @jalinmerapi. Its followers only show interest in the account when there is increasing activity on Mt. Merapi; otherwise, there is an information vacuum and the number of followers decreases (personal interview, 17 March

2014). Similarly, a community member, Setiawan raised the issue of information inconsistency in the Jalin Merapi network after the 2010 eruption. He stated:

> After the 2010 eruption, I rarely accessed their [the Jalin Merapi network] information [...] The last time, I accessed them was when the status of Mt. Merapi increased [in March 2014]. They are not the same as they used to be. I saw that their last update was in February 2013, if I am not mistaken. When the status of Mt. Merapi increased in 2014, they didn't update their website (personal interview, 5 June 2014).

The argument about the easily vanishing weak ties of the Jalin Merapi network is supported by Borgatti and Halgin (2011) who argue that the network ties that are established based on interactions during temporary events, such as a volcano eruption, have shorter continuity over time in comparison to other social ties grounded on kinship or cognitive roles. Moreover, if the instrument or the interest in the event is no longer available, the engaged individuals will lose interest in maintaining continuing participation, and the 'sense of community' is more likely to collapse (Bregman & Haythornthwaite, 2003; Haythornthwaite, 2005; Miller, 2011, pp. 193-194).

In addition to the dependency on the connecting medium and the interest in a temporary event, Jalin Merapi's functions have been heavily dependent on the informal personal friendship owned by the key actors (the community radio volunteers in this case). Consequently, the Jalin Merapi network may be unlikely to survive when the key individuals move on or their friendships are broken up (Meyer and Rowan, 1977, Shannon et al., 2014). Yatin, a head of a village, also raised the danger of dependence on informal relationships in disaster communication, as below:

> My coordination with my contact persons [in government agencies] is based on personal relationships. This is unreliable. If they are suddenly transferred to other positions, I will be left without information (focus group, 19 July 2014).

Furthermore, turnover of actors may destroy the trust that has been built on the relationships with the particular individuals (IFRC, 2015).

The Jalin Merapi network may not be able to guarantee continuity in the longer term compared to official disaster communication. The character of unsustainability has actually been recognized by various scholars as a weakness of an informal (Griffin et al., 1999, Shannon et al., 2014) and voluntary (IFRC, 2015) organisation such the Jalin Merapi network.

Therefore, similarly to my previous argument on the importance of community engagement in formal disaster management, I also argue that community-based disaster communication cannot simply ignore the existence of local governments to some extent. Incorporating a formal structure and arrangement may ensure the longevity of Jalin Merapi's system by providing a fixed structure that can be adopted by successors in the absence of the initial key actors (Meyer and Rowan, 1977, Shannon et al., 2014, Griffin et al., 1999).

5.4. Community radio stations encourage community participation in disaster communication.

In addition to culturally-embedded broadcasting and the social network owned by the community radio volunteers, the sense of belonging to the community radio stations has encouraged community participation in the Jalin Merapi network. The community ownership was clearly identified by a volunteer of Gema Merapi FM:

> This community radio station belongs to everyone in the Cangkringan sub-district […] everyone has equal rights […] There is no particular village that can claim its ownership although it is located in one particular village (Widiyantoro, personal interview, 11 March 2014).

As discussed in the previous sub section, the community radio stations that participated in the Jalin Merapi network were initially established based on the community need to have their own media as a reliable information source. Thus, the community radio volunteers emphasized that community involvement is an important basis for survival. It was clearly described by one of K FM volunteers as below:

> The main purpose of a community radio station is to manage a radio station that is managed by the community itself so they can inform what they need to know. So, whatever the community wants to be informed of, the community radio station is the only hope (Haji, personal interview, 21 March 2014).

Additionally, the community involvement is an interpretation of being local through radio programming (Lindsay, 1997). This is supported by Fraser and Estrada (2001), Kanayama (2012), and Servaes (1999) who argue that community participation is the main objective of a community radio station for social improvement and is the central focus of community radio programs and the basis for the community radio station's survival. In other words, the

community radio stations cannot broadcast without the voluntary participation of the community they serve. They greatly depend on the community members who volunteer their time and expertise to manage the community radio stations. Therefore, Sukiman, a volunteer of Lintas Merapi FM stressed that establishing the community's sense of belonging and acceptance – through voluntary participation - are more important than establishing the physical community radio station itself (personal interview, 6 May 2014). Similarly, Fraser and Estrada (2001) agree that the real basis of a community radio station is social will, not technical equipment.

Further, I will discuss how the participatory mechanisms of the community radio stations can lead to participation in disaster communication. To distinguish the forms of community participation in the community radio stations, I will classify them into the off-air and on-air forms. *Firstly*, there is off-air participation that takes the forms of personal contributions for radio equipment and personal funding for daily activities and studio requisites. This is particularly driven by the Broadcasting Act No. 32/2002 which regulates that a community radio station is a non-profit organisation and should apply a community-service approach to its communities. Furthermore, it is not allowed to carry any commercial advertising except public service announcements. As a result, the community itself has to voluntarily contribute to the establishment of the community radio station. This principle is supported by Fraser and Estrada (2001) who state that a community has to be fully responsible for the ownership, management, finance, editorial independence and credibility of its community radio station.

The community radio stations have heavily relied on community members during their early establishment and for their daily broadcasting. The community members themselves participated by contributing radio equipment, as described by Asnawi, a volunteer of K FM: 'Someone gave away a computer [...] a fan [...] a radio mixer [...] music CDs [...] whatever they had [...] for this community radio station' (personal interview, 21 March 2014). Similarly, a volunteer of Gema Merapi FM added:

> We all manage this radio station. If something is broken, we fix it together. We don't put the responsibility on one particular person [...] We have a donation box for radio operationalization (Widiyantoro, personal interview, 11 March 2014).

The voluntary contribution was not limited to radio equipment and finance, the community members also provide spaces for the community radio stations. The studios of Lintas Merapi

FM, Lahara FM, and MMC FM are located in private residences; meanwhile, K FM and Gema Merapi FM are located in public buildings, which are the public school and the government multi-purpose room. In general, lack of financial support becomes the biggest problem in the management of community radio stations, which frequently leads to unfeasible equipment and high personnel turnover.

Secondly, one form of on-air participation is when the community members provide information to the community radio stations. As community media, the main purposes of the community radio stations participating in the Jalin Merapi network are to provide valid local information that is needed by their surrounding communities, and to be a medium in which the community members can provide their information in their own ways. The interviewed community radio volunteers strongly emphasized the local capacity to be the information sources of Merapi information - instead of just being the audience - in disaster communication. This was triggered by the fact that the communities had to watch national television broadcast from Jakarta, which is approximately 560 km away from the Merapi volcano, when they required information about the Merapi volcano. Some community members even relied on the television news as the basis for their evacuation decisions. In his interview, Sukiman, a volunteer of Lintas Merapi FM, found the habit of relying on the national television stations to gain information about Mt. Merapi ironic because the information they get from the national television stations is actually the information that comes from their own surroundings. He stated:

> We are the information sources (about Mt. Merapi). The journalists come here (to get our information)…we are the ones who get interviewed. Why do we wait for the news that is edited at Jakarta? Too long! (personal interview, 6 May 2014).

Thus, the community radio volunteers stressed that the Merapi people themselves have the capacity to fulfil the demand for reliable local information. The listeners of the community radio stations usually provide information to the radio stations through direct conversations with broadcasters when visiting the radio stations, or through SMS, phone calls, and communication radio for simplicity and low cost. Moreover, a volunteer of MMC FM added that the community radio stations also frequently invite community members to talk on air about their personal experiences of the previous Merapi eruptions (Mujianto, personal interview, 26 April 2014). Nowadays, the participation process is simplified by social media, as described by a volunteer of Lintas Merapi FM below:

> The community members are aware…because they need it [the information] [...] it [the participation] is not limited to information providing [...] they also seek the information [...] lately they use social media because it is easier [...] Facebook, Twitter, Whatsapp…BBM [BlackBerry Messenger] [...] our communities have our own Whatsapp group (Sukiman, personal interview, 6 May 2014).

Yet, the participation level varies among the community members, mainly depending on their access to communication technologies in order to be able to participate. The challenge of information provision mostly emerged in the early stage of the community radio stations' establishment. Initially the community radio stations sent their reporters to directly gather information from the community members and subsequently broadcast the information in a one-way communication process. At that time, the difficulty of providing information was mostly because the community members could not afford the communication technologies. However, rather than passively waiting for the listeners to increase their economic ability to buy the technology, the community radio volunteers have also actively assisted their listeners so they can easily provide information to the community radio stations. For example, Lintas Merapi FM arranged fund raising to provide mobile credit for the community members, so they could send SMS to the community radio stations in the 2006 eruption. Hence, in addition to the recognition of community participation as their foundation as community media, the community radio stations also aim to build community capacity in participation.

The participatory mechanism also applies to radio management and the production of radio programs. The community radio stations which participate in the Jalin Merapi network develop their programs based on the communities' feedback. The interviewed community radio volunteers argued that their programs are dedicated to the community; hence, they have to be "created" by the community members themselves. In particular, a volunteer of Lintas Merapi FM explained:

> A community radio station has to be conceptualized at the community level…dedicated to the community [...] The on-air broadcasting is not the most important thing, but a [community] radio [station] has to be the "symbol" of all activities of the community [...] A community radio station has to be established by the locals (Sukiman, personal interview, 6 May 2014).

In comparison to commercial radio stations, a volunteer of K FM described that the community radio programs are usually more flexible and can be modified based on the

listeners' requests (Santosa, personal interview, 21 March 2014). The approach is known as the 'patchwork quilt' as a community radio station always tries to combine the special interests of the public within its programs (Kidd, 1992, p. 177). Furthermore, in comparison to formal emergency systems that use warnings and announcements, flexibility becomes a strategic approach in responding to uncertainty in a disaster response (Romo-Murphy et al., 2011, Sellnow et al., 2002).

As well as flexibility in the content of radio programs, the interviewed volunteers of community radio stations also emphasized the value of flexibility in programme schedules to respond to local needs. In practice, the community radio stations that participate in the Jalin Merapi network always adapt their broadcasting schedule to their listeners' daily livelihoods, including the time when people are coming home, relaxing, not needing visual entertainment, and ready for traditional music. The community radio stations, henceforth, start their broadcasting in the afternoon until midnight. The flexibility is particularly important because of the recurring change of livelihood within the Merapi communities. Further, the change is influenced by the time when the community members are in radio coverage. It was clearly explained by Haji, one of the K FM volunteers, as below:

> We are always improving our radio station in terms of contents and schedule. We evaluate that the community was changed after an eruption…The livelihood changes after an eruption has occurred [...] The fields are ruined, so the farmers cannot harvest anything and lose their capital [...] Then, they change their job to be labourers, construction workers, or sand miners [...] When they were farmers, they came home at 2 pm [...] They are within our radio coverage [...] Meanwhile, a labourer comes home at 5 pm [...] They spend more time outside our coverage area [...] This changes our broadcasting schedule. We now mostly broadcast after dark [...] Television broadcasting also determines our schedule. At primetime, it will be useless to broadcast because people will be more interested in watching television. We broadcast when people start to take a rest and do not need visual entertainment (personal interview, 21 March 2014).

This finding supports Fraser and Estrada (2001) who also identified that a community radio station has to consider its listeners' needs, preference, and habits concerning program content, duration, and schedule.

In addition to community engagement in the on-air programs, the community radio stations also encourage their community members to actively participate in their off-air programs.

The off-air programs are regarded as more effective for promoting radio stations and building steady relationships with the community members. Interestingly, the community radio broadcasters claimed that the on-air programs are not always the priority - simply facilitating any localised communities' activities is the priority. A volunteer of Gema Merapi FM even claimed that the off-air events are symbols of community activities and more beneficial to the communities (Widiyantoro, personal interview, 11 March 2014).

In summary, based on the clear self-conception within the community radio stations participated in Jalin Merapi, the community radio stations' participatory mechanisms have successfully established a sense of community ownership and encouraged community trust in the community radio stations' alignment to genuinely voice the community interests. Yet, this does not necessarily mean that community members agree that the mechanisms are succesful in articulating community interest because that is much harder to establish and is outside this research scope. The way the affected community members participated in Jalin Merapi through the community radio stations will be discussed in more detail in the next chapter. Similarly, Seeger (2006) and Romo-Murphy et al. (2011) agree that interactive participation between local communities and community radio stations will develop credibility and trust. Furthermore, the generated sense of ownership and trust go 'beyond formalized partnership and participation mechanisms' (IFRC, 2015, p. 59). Despite the absence of formal regulations obligating community participation, the sense of community ownership established by the community radio stations can enhance a sense of community solidarity, which further facilitiates motivation to voluntarily participate in community-based disaster communication conducted by the community radio stations; in turn, the participatory mechanism in the communication process between them is more likely to continue in any stage of a disaster because of the sense of ownership.

In fact, before the 2010 Merapi eruption, community radio stations were used for the stages of early warning, emergency response and recovery in some natural disasters in Indonesia, such the 2004 tsunami in Aceh (Swara Meulaboh FM, Suara Sinabang FM, Seha FM, Al Jumhur FM, and Samudera FM), the 2006 earthquake in Yogyakarta (Pamor FM and Angkringan FM), and the flood in South Sulawesi (MBS FM and Champuss FM) (Birowo, 2009, Romo-Murphy et al., 2011, Tanesia, 2007). However, Tanesia (2007) argued that the community radio stations in those events heavily relied on articles from newspapers and the internet in broadcasting disaster information. This meant the information quoted was often far

too general and inappropriate for the affected communities, and there was limited space for the affected communities to provide information through Short Message Service (SMS).

During the 2010 Merapi eruption, the community radio stations in the Jalin Merapi network faced a totally different situation. With the negative experience of inaccurate information from a national television station and the lack of trust in official disaster communication, the affected community, including the community radio volunteers, heavily relied on the other community members as information sources. Unlike the other community radio stations that limitedly engaged the community members in information providing, those involved in the Jalin Merapi network engaged the affected community in providing, sharing, and verifying community-based disaster information. How the affected community participated in Jalin Merapi will be discussed thoroughly in the following chapter.

5.5.The mechanisms of the Jalin Merapi network for facilitating community participation in disaster communication: the people and the technologies.

The initial mechanisms of disaster-response-communication of the Jalin Merapi network were established to respond to the 2006 Merapi eruption. According to two community radio volunteers, Sukiman (personal interview, 6 May 2014) and Asnawi (personal interview, 21 March 2014), the 2006 eruption became the starting point of community recognition of the important role of the community radio stations as an effective means of disaster communication. In the 2006 Merapi eruption, the community radio stations broadcasted local information required by their listeners, such as information about evacuees, Mt. Merapi's status, Internally Displaced Person (IDP) camps, and missing family members. Specifically, Lintas Merapi FM coordinated 32 patrolling posts and simultaneously broadcast updated information about Merapi from each point. The Lintas Merapi FM also sought external donations for mobile credit to enable them to engage their listeners in providing their information to the radio stations through Short Message Service (SMS); so the information could be broadcast widely to the rest of the community members (Sukiman, personal interview, 6 May 2014). In a different way, K FM broadcast information from the evacuees by inviting them to their studios and asking them to share their information about their condition, visual observations of Mt. Merapi, the locations of IDP camps, and missing family members. A volunteer of K FM specifically stated:

> The 2006 eruption was not too big [...] only the upper villages were evacuated [...] First, we collected donations with Combine's support [...] We invited the refugees to our studio to get the donations every night. We interviewed them about the condition of the refugees and the Merapi volcano. Then, we broadcasted it [...] We also broadcasted about someone who was lost during the evacuation process. He was finally found [...] We continuously broadcasted about the locations of evacuation barracks [...] We did that for 3-4 months [...] Afterward, people started to realize that community radio was effective as a means of local information [sharing] (Asnawi, personal interview, 21 March 2014).

In the 2006 eruption, the Jalin Merapi network utilized a platform of media multiplexity consisting of seven different media: two-way radio, website, Yahoo Messenger, Shoutbox, live audio streaming of the broadcasts of the community radio stations, SMS gateway, land-lined phone and mobile phone. At the time, the affected community mostly provided information about their conditions through the SMS gateway. For the most part, the information was related to complaints about the condition of the evacuation barracks and government disaster responses.

5.5.1. The newly created Jalin Merapi network in the 2010 Merapi eruption

Four years after the 2006 eruption, the platform of media multiplexity of the Jalin Merapi network was reactivated and recreated from 23 October 2010, two days after the status of Mt. Merapi was increased to Level III. At that time, the broadcasters of K FM created the first Facebook group account of the Jalin Merapi network; they have been managing the Facebook account ever since. Right after the first eruption on 26 October 2010, Combine created the first Twitter account in the name of the Jalin Merapi network, which was initially managed by some Combine staff members at Yogyakarta city (approximately 30 kilometres from Mt. Merapi). On the same day, the broadcasters of K FM established the first field post of Jalin Merapi at the home of one of the broadcasters in the Magelang district. Following the action, broadcasters from the other community radio stations established other field posts of the Jalin Merapi network in their own areas.

Demand for information from and to the field posts of the Jalin Merapi network increased rapidly, and could not be covered only by the limited number of broadcasters of the community radio stations. Hence, the Jalin Merapi network opened an online application for recruiting volunteers on its website by using Google Form. The application was open to

anyone who wanted to participate without any demographic restrictions, as described by two volunteers of the Jalin Merapi network:

> Jalin Merapi was open […] anyone was accepted […] although we were able to help for two or three days, Jalin Merapi still accepted us […] There were no time limitations [and] age restrictions […] I am in retirement, but they accepted me […] I found it very difficult to join other voluntary communities […] Where could I help? […] How could I help? It was unclear […] Jalin Merapi was more accessible (Widyarsi, personal interview, 27 May 2014).

> I joined another voluntary movement. It prioritized publication […] The mechanism for donations was too long […] They only gave the donations when there were journalists […] I didn't like it! They just wanted to show off […] Then, I joined Jalin Merapi […] I think it was the representative [of the affected community] […] We could help quickly and appropriately (Negoro, personal interview, 23 April 2014)

As a result, 100 applicants submitted their applications in the first 30 minutes and there were approximately 2500 registered applicants in total. However, based on the requests for volunteers from the field posts, the Jalin Merapi network's 1000 volunteers in total were drawn from the community radio volunteers, the Combine staff members, the evacuees, and outsiders.

The main purpose of the Jalin Merapi network was to provide accurate information about Mt. Merapi and the evacuees. However, the Jalin Merapi network eventually had to deal with aid distribution as an inevitable task to help the affected communities. Thus, the Jalin Merapi network divided its volunteers into two types: information volunteers and logistics volunteers, who were both distributed to one main post (Jalin Merapi - JM *Induk)* and nine field posts (JM1-JM9) (see Figure 19). None of the community radio volunteers were located at the main post; they acted as the Jalin Merapi volunteers at the field posts. The community radio stations closely collaborated with Combine during the 2010 eruption. The Combine staff members, including those interviewed in this research, participated in the Jalin Merapi network as the volunteers located at the main post.

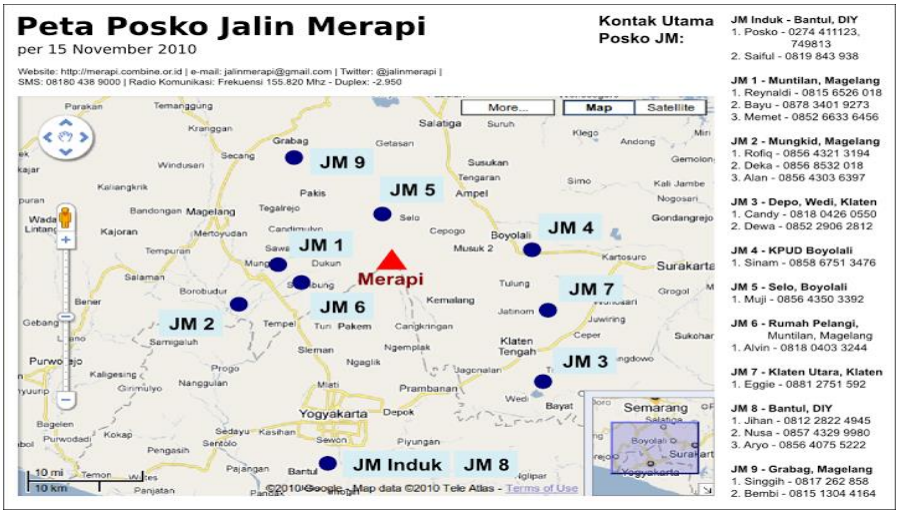


Figure 19. Distribution of the Jalin Merapi main post and field posts (Jalin Merapi, 2010)

The information volunteers in the main post and the field posts had distinctive responsibilities. In general, information volunteers in the main post were responsible for monitoring, sharing, and responding to all information on the different media platforms, and coordinating mostly with the field volunteers regarding information verification. The information volunteers in the main post consisted of seven people who were coordinated by an information coordinator (see Figure 20). Having only seven people in the main post was clearly explained by Widyarsi, a volunteer of the Jalin Merapi network, below:

> It was more effective to have a small team as the main coordination system for such a big job. The most important thing is that what happens in the small team has to be communicated to the rest of the bigger team (personal interview, 27 May 2014).

The information volunteers at the field posts were mostly responsible for gathering and verifying information from the affected community, and updating information on the Google Docs and the Facebook accounts of the Jalin Merapi network. Each field post was coordinated by a field post coordinator, who simultaneously acted as the contact person for any outgoing information from the field post and the local verifier (see Figure 20). However, the task distribution was not strict because the information volunteers might have simultaneously acted as logistic distributors while gathering information at the Internally Displaced Person (IDP) camps. The flexibility was necessary so a field post could cover some IDP camps within a particular affected area. Dougall et al. (2008) agree that a flexibly structured organisation will respond more effectively to disaster than a rigid and hierarchical organisation.

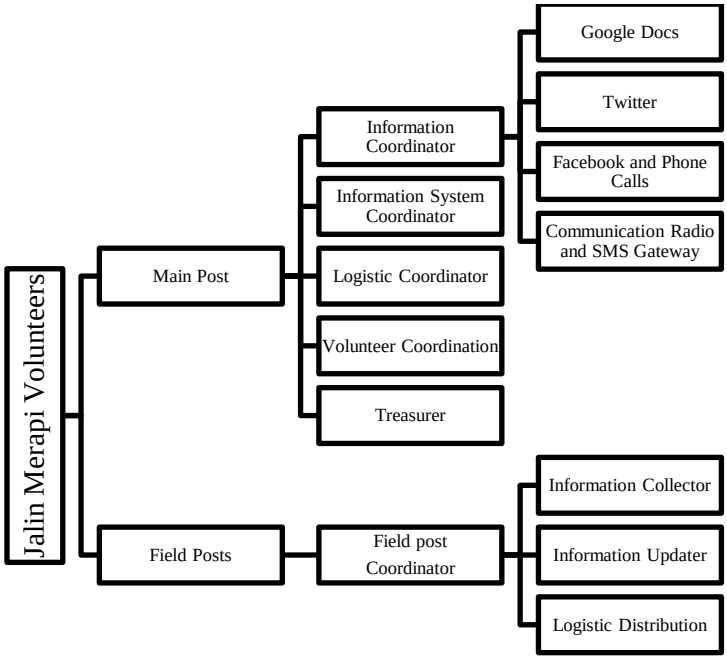


Figure 20. The Jalin Merapi organisation during the 2010 Merapi eruption

As a community-based network consisting of community radio stations relying heavily on community support, the Jalin Merapi network did not have a strong financial foundation during the 2010 eruption. Thus, similarly to the personal contribution to the community radio stations, voluntary participation also took the form of providing support and technical equipment to ensure continuous processes of community-based disaster communication in Jalin Merapi. For example, some affected community members voluntarily provided their homes to be Jalin Merapi field posts; the community radio stations provided radio equipment and local actors; the volunteers provided personal laptops and mobile phones; Combine provided a modem, internet connection and two-way radio equipment; and funding was partly voluntarily collected and supported by the donors.

During the 2010 eruption there was a significant expansion in the number of people volunteering for Jalin Merapi, and the network platform was significantly expanded by using fourteen different media to share information in the 2010 eruption. They were: website, SMS Gateway (08180 438 9000), Closed Circuit Television (CCTV), audio streaming (for community radio's broadcasts and two-way radio), Facebook, Twitter, Blackberry Messenger (BBM), Yahoo Messenger (YM), e-mail, shoutbox, Google docs, mobile and land-lined phone (0274 411 123), and Google maps. Although the local community has been using national television stations to seek information about Mt. Merapi, the Merapi network did

not involve any type of mass media in its media multiplexity. This was particularly because of the inaccurate news of a national television channel that led to distrust in television (see the introduction chapter). The platform of media multiplexity of the Jalin Merapi network will be discussed thoroughly in the next chapter.

5.6.Conclusion

This chapter addresses the second research question by explaining that community-based disaster communication can be regarded as trustworthy and can facilitate community participation when it engages the local cultural knowledge and the tie strength of the local social networks. Specifically, culturally-embedded disaster communication within the affected community is more likely to increase the effectiveness and trustworthiness of disaster information because it can "bridge" the information in convenient ways based upon cultural communication behaviors. When culturally-embedded disaster communication is combined with internet-based media, the combination can facilitate outsiders' exposure to such communication and, simultaneously, encourage trust within the outsiders regarding the authenticity of disaster information as locally-based information from the affected community. Another significant argument that emerged from this study is that both strong ties and weak ties play important roles in a supportive relationship in community-based disaster communication, without necessarily competing with each other. The strong ties of the affected community are more likely to establish social capital, trust, and community participation and are more effective in encouraging the affected community to provide their "inside" information. Meanwhile, weak ties are more effective in disseminating the "insiders' information" to a larger number of people across different communities (e.g. the unaffected community). By engaging online media, weak ties potentially have an indirect influence in encouraging trust, as they extend the offline social networks and trust owned by the affected community. In the next chapter, I will discuss community participation encouraged by the generated trustworthiness in community-based disaster communication, particularly in the case of the Jalin Merapi network during the 2010 Merapi eruption.

Chapter Six

Networked participatory community-based disaster communication

As the first responders, an affected community usually has great eagerness to participate in disaster communication (Hindman and Coyle, 1999, IFRC, 2015). Moreover, the development of mobile and online communication technologies has made information sharing easier for the affected community, even during a disaster response (Harvard Humanitarian Initiative, 2011, Nugroho, 2011). Understanding how an affected community uses communication technologies and participates in information sharing can enable a new approach to existing disaster management, based on a 'many-to-many model' of disaster communication (IFRC, 2015, p. 181). Thus, using the example of how the affected community participated in Jalin Merapi (*Jaringan Informasi Lingkar Merapi* – Information Network of the Merapi Circle) during the 2010 Merapi eruption, this chapter explores how an affected community uses communication technologies and participates in community-based disaster communication. I will begin the chapter by discussing the platform of media multiplexity of the Jalin Merapi network, through which the affected community participated in disaster communication. Based on the definition of Haythornthwaite (2005), media multiplexity refers to the simultaneous usage of multiples means of communication by the volunteers of Jalin Merapi during the 2010 Merapi eruption. Then, I will discuss the participation of the affected community in the community-based disaster communication facilitated by the Jalin Merapi network. Referring to the studies of Palen (2008) and Palen et al. (2010) on forms of community participation in natural disasters, I will focus the discussion of community participation on how the affected communities provided, shared, and verified disaster information through the Jalin Merapi network during the 2010 Merapi eruption. Specifically, community participation in information providing and sharing will be discussed in this chapter, and community participation in information verification will be discussed thoroughly in Chapter Seven.

6.1. Media multiplexity in participatory disaster communication

> Jalin Merapi used technology to answer a classic question of disaster response; how to connect individuals providing support to individuals who need it […] The Jalin Merapi project represents one of the most important and under-recognized ways in which community use of technology in disasters is profoundly different to that of aid agencies and is facilitating the development of new systemic approaches (International Federation of Red Cross and Red Crescent Societies, 2015, p. 190).

In this section, I will discuss the way media multiplexity was used by the volunteers of the Jalin Merapi network, including the volunteers of the community radio stations, in facilitating participation by the affected community in community-based disaster communication. In the discussion, some of the fourteen media used by the Jalin Merapi network such as the SMS Gateway, audio streaming, the Facebook groups and Twitter accounts, and Google Docs will be discussed more thoroughly than the others. This is based on the finding that these particular media were most discussed by the research participants. However, it does not necessarily indicate that the other media, like CCTV, BBM, YM, e-mail, Shoutbox, mobile phone, and land-line phones were not utilised effectively during the 2010 Merapi eruption. They seemed to be treated as supporting media and were used on a more regular basis than the ones I will focus on. In particular, BBM and YM were mainly utilised for coordination among the volunteers. Email, Shoutbox, mobile phones, and land-line phones were mainly utilised by the wider audiences outside the affected areas to ask the Jalin Merapi network about the Mt. Merapi eruption and the evacuees. In the stage of lahars, livestreaming of the CCTV feed was added into the media multiplexity of the Jalin Merapi network, as a response to the information demand for the traffic and road situation of areas through which lahars often flowed.

During the 2010 eruption, the media multiplexity of the Jalin Merapi network had three main characteristics. It was based on existing communication behaviour, integrated the technologies already used by the community in a single platform, and it was adaptive in order to be able to effectively facilitate the community participation.

6.1.1. The media multiplexity based on the existing communication behaviours

As previously listed in Chapter Five, the Jalin Merapi network engaged fourteen media to comprise a platform of media multiplexity in the stage of response to the 2010 Merapi eruption. The media were selected based on the local communication behaviours of the

targeted audiences for whom the disaster communication was intended. This was clearly explained by Nasir, a former Combine staff member who was based at the main-post of the Jalin Merapi network, as below:

> There was nothing new in the technologies we used. They are "old". They were not invented purposively for it [the 2010 eruption]. We intentionally chose the existing technologies based on the assumption that people had been familiar with them. We couldn't choose only one [media] because, in fact, people use each in their own ways. Maybe [it is] because of convenience, economy, using HT [Handy-Talkie/two-way radio] because they don't want to buy mobile credit, practicality. Anything! (personal interview, 17 March 2014).

The number of different media used in the media multiplexity was reasonably consistent with the local media usage of the Merapi people. In practice, the villagers living on the slopes of Mt. Merapi have an established pattern of media selection for seeking and sharing reliable disaster information about Mt. Merapi within their personal networks via multiple channels. They tend to engage a number of media in their information workflow regarding Mt. Merapi. As explained by Haythornthwaite (2005) and Koku et al. (2001), the number of media used in communication may differ from one community to another, depending on the tie strength of the local network; a community with stronger ties uses more media to communicate with one another. As a community with strong ties, as previously discussed in Chapter Five, those living on the slopes of Mt. Merapi are most likely to use numerous different media in their communication behaviours. Thus, if the Jalin Merapi network aimed at facilitating the local existing media usage, the media multiplexity of the Jalin Merapi network needed to engage all media used by the local communities in their local disaster communication behaviour in the Mt. Merapi areas.

Aiming at sharing the insiders' information within the affected community and with the general public, the Jalin Merapi network developed a media multiplexity reflecting the media selections of both targeted audiences. Specifically, the villagers living on the slopes of Mt. Merapi mainly use mobile phones (Short Message Service (SMS) and phone calls), two-way radio (Walkie-Talkie[28]/Push-to-talk radio and Citizen Band radio), and national television to seek and share information about Mt. Merapi in their daily life. Meanwhile, according to Nasir, the general public tend to use social media to get information about Mt. Merapi

[28] The villagers on the slopes of Mt. Merapi are more familiar with the term 'Handy-Talkie' in referring to the two-way radio.

(personal interview, 17 March 2014). The combination of the media usage of the Merapi people and the media usage of the general public in the media multiplexity was clearly explained by a volunteer of the Jalin Merapi network:

> There were fourteen technologies used by Jalin Merapi in managing information […] The usage of those fourteen technologies was based on the characteristics, users, and functions of each of the technologies […] One technology has different users from the others […] their behaviours and needs. The users of Handy-talkie, for example. They have been well-known for their main function in monitoring Mt. Merapi. The pattern of communication has been well established. Unfortunately, their information is only shared among themselves. When Mt. Merapi erupted in 2010, the need of people outside the affected areas for the updated information about Mt. Merapi was huge. Jalin Merapi filled in the gap by sharing the audio information [shared by the users of two-way radio] through the audio-streaming technology and social media (Dewi, personal interview, 26 March 2014).

Because it uses media the affected community was already familiar with, four community members out of the eleven interviewed argued that the Jalin Merapi network was able to fulfil their personal demand for information by facilitating the accessibility of locally-relevant information. It was particularly so because of the usage of two-way radio as one of the most used media in local disaster communication. However, the remaining seven interviewed community members argued that the network was not as effective as possible in reaching all affected community members because it did not include television, another medium that is widely-owned by the Merapi people. The reason for not including television in the media multiplexity was because of the misleading news that further led to distrust in the national television station during the 2010 eruption (as discussed in Chapter One).

Therefore, based on the findings, I argue that it is important to select and use the media that a community already uses in daily communication behaviours and is familiar with in local disaster communication. Familiarity with an information source and the media used in disaster communication plays a significant role in promoting the effectiveness of disaster communication particularly in the context of a community-based information network. In their disaster communication, people tend to use familiar channels that are convenient for them, regardless of the actual effectiveness of the channel. This tendency can be observed in the usage of the two-way radio. Despite being arguably ineffective and untrustworthy, the number of two-way radio users is increasing within the local communities living on the

slopes of Merapi, which may be led by their familiarity with two-way radio as the channel of community-based disaster communication since the 1990s.

This use of familiar media fits the Uses and Gratification Theory (Rubin, 1994) and the Channel Complementarity Theory regarding media selection. It also reflects previous studies (for example, the studies of Austin et al., 2012; Dutta-Bergman, 2004; Hollingshead et al., 2007; Ruggiero, 2000; Steelman et al., 2015; Whitting and Williams, 2013) emphasising that individuals tend to select and use specific media with which they are familiar and are tied into their existing information flows, regardless of the perceived usefulness of the selected media. Nonetheless, being familiar with, or the convenience of particular media, if accompanied by trustworthy sources, may facilitate better access and effective usage when it is most needed in a disaster response (Steelman et al., 2015, Jaeger et al., 2007). Further, selecting media based on the existing communication behaviours of the affected community can facilitate community capacity to participate in disaster communication in a familiar and convenient way.

The argument that it is important to engage multiple media based on the local media usage in the local communication behaviors of the affected community is different from the mainstream approach to disaster communication as below. This was clearly stated by Nasir, a former Combine staff member who was based at the main-post of the Jalin Merapi network:

> The most common and mainstream approach of information technology has been inventing a new special platform. Then, pushing people to use it. Maybe it is appropriate for a closed and structured model, meaning that it will be used by a certain institution or by trained officers. But, for the open public, it won't work and is ineffective (personal interview, 17 March 2014).

His argument mirrors the issue raised by the International Federation of Red Cross and Red Crescent Societies (IFRC) in its 2015 World Disaster Report. They identified the risk of assuming everyone uses the same communication technologies in the same way, and that humanitarian responses to a disaster often take the form of a sudden introduction of a new platform of communication technology as a novel solution in communicating with the affected community. However, during a disaster response, an affected community is unlikely to learn a new platform, which they have never dealt with, because they 'are likely to be overwhelmed by the response itself' (p. 194).

Imposing a new platform of communication technology by overlooking the local pattern of disaster communication can render disaster information inaccesible, such as occurred in the official disaster communication of the Mt. Merapi eruption. As also discussed in Chapter Four, Setiyoko, a community member (personal interview, 8 July 2014) and Sukiman, a volunteer of Lintas Merapi FM (personal interview, 6 May 2014), separately stated that some official disaster information was still inaccessible because of the incompatibility of media usage between the authorities and the villagers living on the slopes of Mt. Merapi. Two other community members confirmed:

> Government officials should be prepared with all important information, and be willing to share it to the communities […] They have to be open-minded and have the skill to use various communication technologies based on the community's preferences, so they can become more accessible (Wulandari, personal interview, 7 July 2014).

> People don't know about the existence of the SMS gateway [of the BPPTKG vulcanology research unit]. What is that? Those who know are those who accessed the Facebook account [of the BPPTKG] and read that it has SMS Gateway, BBM, and Whats app group too […] Those who have the technologies to access social media. I don't! I am also not sure that the youth who have Twitter and Facebook also subscribe to it [the SMS gateway]. I am not sure about it (Julianto, personal interview, 8 July 2014).

Moreover, ignoring or removing a particular medium from the existing information workflows requires the communities to instantly change their behaviours to re-establish their existing information flow, and this is likely to be very difficult during a disaster response. A channel loss potentially has a negative effect on the tie strength (Miczo et al., 2011) and the behaviours of disaster communication (Harvard Humanitarian Initiative, 2011). Specifically, Haythornthwaite (2005, p. 141) explains that the disengagement of former communication means can affect individuals' access to disaster information, in regards to 'where and when information can be received, and who has immediate, at-home access to such information'. It may also remove the existing interactions that previously had been maintained by the discontinued medium. Moreover, an affected community with strong ties, such as the local communities living in the area surrounding Mt. Merapi, will most likely resist using a new medium if they find it does not suit them (Haythornthwaite, 2005). Again, this strengthens the significance of engaging the media that the disaster-affected community is already using and is familiar with in disaster communication.

6.1.2. The integrated platform of media multiplexity

In addition to the importance of establishing media multiplexity based on the existing communication behaviours of the targeted audience(s), the Jalin Merapi network also emphasised the importance of integrating media into an accessible platform. In practice, a Combine staff member who was based at the main-post of the Jalin Merapi network, Wijoyono explained that the fourteen media platforms were integrated on the website of the Jalin Merapi network, so that 'the website of Jalin Merapi was a portal to a lot of media' (personal interview, 17 March 2014).

Figure 21. The display of media multiplexity on Jalin Merapi's website (modified from Wijoyono (2013).

The integrated media multiplexity of the Jalin Merapi network was aimed at accommodating different preferences of media usage within the targeted audiences and integrating the strength of each medium engaged in their community-based disaster communication during the 2010 Merapi eruption.

Firstly, integrating the multiple media into a platform can connect different audiences who use different types of media in their disaster communication. As previously discussed, Jalin Merapi aimed at sharing the information of the affected community to the general public and vice-versa; they both used distinct media in their communication behaviours. By identifying and compiling the existing media used by both the targeted audiences into an integrated platform, the Jalin Merapi network could simultaneously gather and connect the users of different media. Moreover, as community members often seek and transfer reliable information through cross-channel clusters of media in order to leverage their collective capacities (BBC, 2012, Palen, 2008, Reagan, 1996), Jalin Merapi's platform could simplify

the processes of seeking information from multiple media and transferring information from one medium to another.

The argument was explained by Nasir, a former Combine staff member who was based at the main-post of the Jalin Merapi network, and Dewi, a volunteer of the Jalin Merapi network, as below:

> It was a real organic convergence. We observed what [media] people had been using, then we gathered them […] At that time, Twitter users were the middle-class and upper-middle-class people. They often asked "What do you need? What can we help with? Where? Who can be contacted? […] Meanwhile, the needy ones "shouted" their needs via SMS or Facebook […] By sharing their needs on Twitter, we could bring the needy ones to the people who wanted to help. If there was only one platform, people who used SMS could not "meet" the Twitter users […] We did not want to change [or] lead people to choose one [medium]. We created an integrated terminal (Nasir, personal interview, 17 March 2014).

> One of the lessons learnt from Jalin Merapi is that a convergence of technologies and media is a must. We can't rely on one particular technology. Beside, a convergence of technologies is conditioned by a convergence of actors. Each actor or community has their own behavior and need for information (Dewi, personal interview, 26 March 2014).

The discrepancy between media preferences within the targeted audiences can be exemplified by the preferences of the community radio volunteers and the Combine staff members, which represent the different media usages between the Merapi people and people outside the affected areas. At that time, the community radio volunteers were more familiar with Facebook than Twitter and considered Twitter to be too complicated. Hence, they preferred Facebook for information sharing during the 2010 Merapi eruption; this was clearly stated by a volunteer of K FM:

> Facebook was the easiest. The Facebook groups were initially closed to communicate with other community radio volunteers […] We provided and exchanged our information in that group. Every member could write and read [all the information] from the very beginning in such a consecutive plot (Haji, personal interview, 21 March 2014).

On the other hand, the Combine staff members and most of the volunteers located at the main post of the Jalin Merapi network, who represented people outside the affected areas, preferred

Twitter because it was considered to facilitate rapid sharing of important information. Sundary, one of the volunteers located at the main post of the Jalin Merapi network, stated:

> Twitter is the most open social media to spread information […] It is faster […] It can be followed by millions of people. Moreover, a live tweet is more reliable than Facebook […] Because of its limited 140 characters, people tend to only inform about important things […] On Facebook, there are too many features: chat, group, fan page, etc. On Twitter, we can monitor the track, especially by Chrip story (personal interview, 21 April 2014).

In regard to the discrepancy, the Twitter accounts were used to share the most updated information to the wider audiences; meanwhile, the Facebook groups were used for internal coordination, discussion, and information verification. Despite the different purposes, all social media accounts of the Jalin Merapi network were displayed on the website of Jalin Merapi. Integrating the accounts of Twitter and Facebook of the Jalin Merapi network onto its website can gather both of the users of the distinct social media accounts. Moreover, the Twitter followers can easily access the information mentioned on the Facebook groups, and vice-versa.

Secondly, integrating the engaged media into a platform is not solely based on the argument to connect different audiences who use different types of media in their disaster communication, but also as a response to the fact that each medium has its own weakness and strength in disaster communication. This argument is built on my finding that the research participants had different opinions on which media is the most suitable for community-based disaster communication, as they regarded each medium as having weaknesses in effectively fulfilling the information demand of the local communities. This finding is similar to the studies of Fronz (2012) and Palen et al. (2010) emphasizing that each communication channel has a different level of trustworthiness, exposure, affordability, and availability. What the interviewed community members thought about specific media in community-based disaster communication will be discussed here with a focus on SMS, two-way radio, and social media.

Mobile phones are very common within the Merapi communities (Mei et al., 2013), and all interviewed community members liked to use SMS in their disaster communication. Wulandari, a community member, stated that SMS can ensure the trustworthiness of information because the sender is traceable, which means it can be verified in response and any misunderstood information can be clarified (personal interview, 7 July 2014). However,

the research participants also acknowledged the limitations of SMS during a disaster response. Adji, a community member (personal interview, 22 July 2014), and Yatin, a head of village (focus group, 19 July 2014), argued that SMS through a mobile phone is not very reliable because of its dependency on electricity and mobile networks. Adding another limitation of SMS, Setiyoko, a community member (personal interview, 8 July 20140, and Setyawan, a volunteer of Lahara FM (personal interview, 20 March 2014), described that the mobile network always collapses or jams during an eruption; so, sending a text message can be very slow. Similarly, another community member, Purnomo added that some areas surrounding Mt. Merapi have unstable mobile connectivity, so it is often difficult to send a text message (personal interview, 8 July 2014). The limitation of SMS technology can be observed through the number of text messages provided by the affected community into the SMS gateway of the Jalin Merapi network during the 2010 eruption. According to Nasir from Jalin Merapi, there were only approximately 5,000 incoming text messages (personal interview, 17 March 2014), which was a very small number in comparison to the high number of mobile phone users in the area around Mt. Merapi[29]. Arguably, the small number of incoming messages may be determined by a lack of community awareness of the number of the SMS gateway for the Jalin Merapi network.

Regarding the usage of two-way radio, in Chapter Four I discussed its use as an example of how bottom-up disaster communication can lead to overlapping information. However, this does not necessarily mean that the local communities living on Mt. Merapi's slopes have stopped utilising two-way radio in their community-based disaster communication. Similarly to the debate over the effectiveness of SMS usage, the research participants had divergent perceptions of the effectiveness of two-way radio, as shown in the table below:

Pro	Contra
• Two-way radio users provide reliable information because of their mechanism in reporting information on the spot. Additionally, they also refer to BPPTKG for information about Mt. Merapi. • Two-way radio users have close personal relationships (as being the part of the community) and have a long history as the most accessible 'channels' who socialise information directly to the community members.	• A large number of users, the involvement of people outside the affected areas, and lack of coordination between the two-way radio users create confusion over its overlapping information with an unclear information source. It eventually becomes an unreliable medium. • The frequency of two way radio becomes 'too crowded'. It is difficult to ask for urgent needs. • A two-way radio is more suitable for

[29] For example, there are 5,703 households with mobile phones in the Cangkringan sub-district of the Sleman district (BNPB, 2010); Cangkringan is one of 20 sub-districts that were affected by the 2010 Merapi eruption.

• Each frequency is owned by an organisation/community, so it offers clarity of information sources. • Its rapid information sharing and endurance, especially when mobile communication and electricity is shut down. • A two-way radio is considered to be a means of informal disaster communication to seek the official information from BPPTKG and local government. • The coordination among the BPBD, National Army, Police force and the authorities in all levels, is mostly performed by the means of two-way radio.	coordination, not to gain reliable information. • Lack of knowledge of two-way radio's functions and communication skill within its users. Henceforth, they tend to modify the information or share any information they heard from other users without verification. • The users of two-way radio need to provide their information consistently, especially regarding the level of lahars. • The users of two-way radio are more likely to use unfamiliar and unofficial terminologies, compared to local daily language and the official standard of radio communication. Therefore, they need to adapt and make their terminologies uniform in order to be easily understood and considered officially valid • The usage of two-way radio has been increasingly insufficient because of its limited coverage in one-to-one points and is regarded as exclusive to certain people because it is an expensive device.

Table 3. Pro and contra in regard to the effectiveness of two-way radio

The divergent perceptions of the effectiveness of two radio is unlikely to be determined by individuals' ownership or usage of two-way radio because those against the effectiveness of two-way radio may still have owned or used that medium. The main criticism within the divergent perceptions relates to the inconsistency of information shared by the users of two-way radio in the area surrounding Mt. Merapi, as previously discussed in Chapter Four. Each group of users is in their own unique subculture by using unique terminologies based on their individual understanding in interpreting and sharing information about Mt. Merapi. They are not organised into a community network like the Jalin Merapi network. The way Jalin Merapi networked the community radio stations circling the Merapi volcano simultaneously generated mutual standards of information sharing within the network to ensure the uniformity and reliability of information, which will be discussed in the next chapter. Consequently, without a network connecting all the groups of two-way radio users, there has been no mutual standard of reliable information shared via two-way radio in the area surrounding Mt. Merapi.

Regardless of the debate, most of the interviewed community members agreed that two-way radio is still regarded as an effective channel for disaster communication and the most-owned technology for disaster communication by Merapi people. Wulandari, a community member, and Sukiman, a volunteer of Lintas Merapi FM, gave examples of the ownership of two-way

radios around Mt. Merapi: there is at least one two-way radio in every five houses in Sewukan village – Magelang (Wulandari, personal interview 7 July 2014), and approximately 30 two-way radios in a village in Kemalang sub-district – Klaten (Sukiman, personal interview, 6 May 2014). Similarly, the officials identified that there are 20 groups of two-way radio users in Sleman district, and 27 groups in Magelang district.

Another example is the technology of internet-based media, particularly social media. Although internet-based communication technologies have increasingly become a means to share insiders' information to the general public in the various recent disasters (Sutton et al., 2008, Austin et al., 2012, Crowe, 2012), some community members interviewed stated that social media do not fit the daily media usage of the Merapi people because of the lack of internet literacy[30]. A community member, Julianto stated, 'it [the usage of social media] was effective for people outside the affected areas […] not for the insiders' (personal interview, 8 July 2014). In a separate interview, another community member stated the same argument:

> It [the usage of social media] was not appropriate for sharing information to the locals […] Our local livelihood is mostly related to physical field work, we do not always get connected to the computerised media […] But, it was appropriate for people outside the affected areas who wanted to donate […] Individual donators usually face difficulties in delivering their donations. Jalin Merapi shared [information] that this person needed that aid (personal interview, 5 June 2014).

Also, another community member, Adji described that some of the Merapi people, especially the elders and the farmers, cannot afford internet technologies (personal interview, 22 July 2014). Yet, the argument that social media is not the most effective tool in disaster communication in the area around Mt. Merapi is not simply due to limited ownership of internet technology. Those who have internet connections also agree that the internet is ineffective because of slow connection speeds.

The inaccessibility and slow connectivity of internet technologies are not the only elements of internet illiteracy within the communities living on the slopes of Mt. Merapi. I identified the

[30] Although Indonesia has the fourth largest Facebook subscriber base in the world with approximately 65 million monthly active users (The Jakarta Post, 2014a) and the fifth biggest Twitter subscriber base in the world with 29 million users (The Jakarta Post, 2014b), these numbers are concentrated in the big cities. Again, although the number of Indonesian internet users reaches 88.1 million (Indonesian Internet Provider Association/*Assosiasi Penyelenggara Internet Indonesia* - APJII, 2014), the number only represents 17 internet users per 100 people (The World Bank, 2014), while 65.1% of total population has not used the internet in Indonesia (APJII, 2014). Most communities in remote areas, including some areas in the Merapi volcano, still have difficulties accessing mobile and internet connections due to a lack of supporting infrastructure.

sociological stereotypes of the careless young internet users and the uneducated community members reduced the likelihood that others would use the information shared on internet-based media by those stereotyped groups. According to Julianto, a community member (personal interview, 8 July 2014), the Sleman officers, and the Magelang officers, most social media users in Mt. Merapi are the youth who tend to trust the information they gain from the social media without further verification. This leads to a fundamental bias about the inaccuracy of social media information because of the sociological stereotype of the young generation as careless people (Crowe, 2012). Additionally, some of the interviewed officials also considered most Merapi people to be incapable of efficiently and appropriately using internet-based media because of their low level of education, despite being able to afford the technologies. Consequently, accoding to Yatin, a head of a village, the incapability can lead to the possibility of inaccurate information sharing (focus group, 19 July 2014). Regardless of whether the stereotypes are accurate or not, this finding shows that stereotyping affects how individuals view the veracity of internet-shared information. In other words, media usage in disaster communication cannot only refer to the effectiveness of a particular medium regarding message exposure and accessibility, but also requires understanding of how the affected community regards the trustworthiness of the particular media.

In addition to the benefit of accommodating different preferences of media usage by the targeted audiences, integrating the existing media into an accessible platform can solve the limitations of each medium by integrating its strengths. For example, those with limited access to internet technologies could provide information by means of SMS instead or seek information via two-way radio. To share SMS messages to the wider audience, all incoming text messages were automatically published on the website of Jalin Merapi in a form of running text. Again, the limited coverage of two-way radio, which only covers one-to-one point, and the limited coverage of a community radio broadcast, which only covers a certain small area, can be solved by online audio streaming on the website of the Jalin Merapi network. So, the one-to-one point conversation of the users of two-way radio and the radio broadcast can be simultaneously shared to the wider audience, regardless of their geographic locations. Hence, it is also important to recognise that relying on a single medium may not reach all community members, because a specific medium may only be accessible to a specific audience within a specific social network.

Moreover, the finding of the integrated media multiplexity shows that the novelty of communication technology does not guarantee effectiveness or utilisation by the targeted

community. Being novel in disaster communication does not necessarily mean switching from the former offline means of communication (e.g., two-way radio and SMS) to the most advanced online media. Therefore, internet-based media need to be used deliberately without neglecting traditional media, but integrated in such a complementary way (Austin et al., 2012, Liu and Jin, 2010, Crowe, 2012). By combining the traditional channels of communication with internet-based communication technologies, it may be possible to combine exposure and familiarity in disaster communication.

6.1.3. The adaptive structure of media multiplexity

In addition to the value of being based on the existing communication behaviours of the targeted audience(s), I argue that an integrated platform of media multiplexity needs to have an adaptive structure to respond to the emerging changes in local media usage and the information demands of the targeted audiences. This argument is built on the finding about the adaptative changes in the media platform of the Jalin Merapi network. The adaptation can be exemplified by the increased number of media engaged in the media multiplexity, which can be clearly observed by comparing the initial version of the media multiplexity used in the 2006 eruption to the version used in the 2010 eruption. The initial version brought together two-way radio, website, Yahoo Messenger (YM), Shoutbox, live audio streaming of the broadcasts of the community radio stations, SMS gateway, land-line phone and mobile phone (see Figure 22). Keeping up with the novelty of communication technologies used by the affected community and the general public, the media multiplexity of the Jalin Merapi network was expanded by adding other media (Twitter, Facebook, BBM, Google Docs, and CCTV) during the 2010 eruption. The addition also aimed at reaching the wider audiences and broadening community participation in information sharing.

Figure 22. The initial website of Jalin Merapi used in the 2006 Merapi eruption (Combine, 2007) (left) and the website of Jalin Merapi used in the 2010 Merapi eruption (2016) (right).

Additionally, the adaptive structure of the media multiplexity of Jalin Merapi can be observed clearly through the proliferation of its social media accounts on both Facebook and Twitter. The first Facebook group was initially closed to the public and dedicated to internal coordination among the community radio volunteers. Later, it became publicly open, however it remained restricted because of the member limitation of a Facebook group-page, which was 250 members at that time. As soon as the first group reached that number, the community radio volunteers created another Facebook group, and so forth. Sentosa, a volunteer of K FM, explained the process:

> It (the first Facebook group) was open and all volunteers could be its members […] It became public and anyone could access it […] Everyone could register his friends to be its members […] Even the aid organisations […] Later, it was overloaded and reached the limitation of 250 members in two weeks […] We created the second group […] it grew more (personal interview, 21 March 2014).

During the stage of disaster response to the 2010 eruption, from September 2010 to July 2011, the Jalin Merapi network consecutively created and used four Facebook groups in total: Jalin Merapi, Jalin Merapi [Alternative], Jalin Merapi 3, and Jalin Merapi 4, and 1 Facebook Fan-page.

The Facebook groups are different from each other in regard to their membership. Although the Jalin Merapi network did not determine the membership of each group, a previously

existing member tended to register his/her friend into the group he/she joined. As a result, each Facebook group invariably consisted of members of a certain friendship network. Further, the different types of membership led to different topics of discussion on the Facebook groups, as explained by a volunteer of the Jalin Merapi network:

> Anyone could be a member [of the Facebook groups of the Jalin Merapi network]. However, the discussion's content was determined by the majority of its members […] For example, there was a Facebook group most of whose members were the NGOs [Non-Government Organisations] that helped the Jalin Merapi network. It didn't mean that all NGOs had to be its members, but it happened that most of them were the members of NGO by itself. There was a Facebook group most of whose members were community radio broadcasters; there was one where most of the members were volunteers [of the Jalin Merapi network] […] If the majority was from the NGO, they would have mostly discussed donations […] the volunteers would have discussed the demands […] So, we can imagine the diversity of the Facebook groups' content (Dewi, personal interview, 26 March 2014).

Similarly to the Facebook groups, the Twitter account of Jalin Merapi also proliferated during the response stage of the 2010 Merapi eruption. A few days after the creation of the first Twitter account @jalinmerapi (as the main account to share information in Bahasa Indonesia), another Twitter account (@jalinmerapi_en) was created by the volunteers, who were located at the main post of the Jalin Merapi network, as an English translation of @jalinmerapi. The @jalinmerapi-en was dedicated to the international public who sought information about the 2010 eruption and did not understand the Indonesian language. The process of creating the @jalinmerapi_en account was explained by Nasir, a former Combine staff member who was based at the main-post of the Jalin Merapi network, as follows:

> There were some suggestions to create an English version from our followers. We tweeted that we had limited administrators. "Is there anyone who can be a translator?" […] lots of them! There were approximately 100 people who wanted to be the translators […] We created the account [@jalinmerapi_en] and entrusted its password to some followers. They only monitored @jalinmerapi, translated, and tweeted it […] They only copied and pasted [the information] […] they were located somewhere else, not in the main post [of the Jalin Merapi network] (personal interview, 17 March 2014).

Later, the volunteers located at the main post of the Jalin Merapi network created another Twitter account, @jalinmerapi_adm. It was dedicated to the general public who needed more detailed information than the 140 characters of a tweet, for internal coordination, and

functioned as a backup account when the @jalinmerapi was overloaded. Zulivan, a volunteer of Jalin Merapi, described:

> @jalinmerapi_adm was for internal coordination and functioned when the @jalinmerapi was overloaded […] When that happened, we could not tweet; meanwhile, there was a lot of important information (that had to be shared), so we used the @jalinmerapi_adm […] We also used it for a longer conversation [for the followers who requested more detailed information] […] otherwise, it would have "littered" the @jalinmerapi (personal interview, 17 March 2014).

In total, during the 2010 Merapi eruption, the Jalin Merapi network created and used three Twitter accounts: @jalinmerapi, @jalinmerapi_en, and @jalinmerapi_adm. Unlike the additional Facebook groups that functioned as additional spaces for more members of those who sought information from the Jalin Merapi network, the additional Twitter accounts addressed distinctive types of disaster information as the situation developed.

The finding that the media multiplexity of the Jalin Merapi network has an adaptive structure emphasises the value of flexibility in media usage in order to adapt to the rapidly increased need for information and the emergent needs for different types of disaster information during disaster response. In particular, flexibility is most likely to be provided by an informal community-based movement, such the Jalin Merapi network, compared to formal organisations. As discussed in Chapter Four, the bureaucratic and top-bottom structures of formal disaster communication performed by the local governments are unlikely to provide flexibility (Shannon et al., 2014). On the other hand, the informally loose and fluid friendship in the Jalin Merapi network can provide flexibility and creativity in responding to the changes they faced during the 2010 eruption. This finding strengthens my argument that the engagement of informal elements of a community into the formal structure of official disaster communication enables 'creativity and flexibility to sit within a context of continuity and stability' (Griffin et al., 1999; Shannon et al., 2014, p. 649).

6.2. Community participation in community-based disaster communication

I have discussed the lack of an official mechanism to deliver specific types of official and locally-based information directly to the affected community in disaster communication in Chapter Five, which mirrors some studies that have acknowledged that particular issue in various disaster responses (Birowo, 2009, Harvard Humanitarian Initiative, 2011, Tanesia,

2007). Conversely, the absence of a direct channel of communication to the affected community creates a barrier for the affected community to communicate its disaster information including specific needs to the external stakeholders, particularly the authorities and potential donors. Consequently, the local governments and the donors tend to generalise the needs of disaster-affected evacuees. Those who want to help the affected community often do not acknowledge that the needs of one evacuee may be different from another and may change over time.

The tendency to generalise the needs of disaster-affected community often results in inappropriate responses to the local conditions of disaster affected areas and the unique individual needs of the affected community. For example, tons of used clothes were wasted because the evacuees did not require them; this was clearly described by Julianto, a community member, Negoro, a volunteer of Jalin Merapi and Sundary, a volunteer of Jalin Merapi, as below:

> In a disaster response, the first thing people think to donate is clothing […] We don't need that! It is insulting […] Some donations were inappropriate such as torn underwear, broken toys […] It was so inappropriate! […] Well, some take the clothing donation, but lots always become a waste (Julianto, personal interview, 8 July 2014).
>
> Clothing donations were actually required right after the eruption […] but they came a week later […] the donors needed time to collect and deliver the donation […] The time difference was too long […] If the need was not responded to quickly, it would have been changed […] 80 tons of clothing donation became a waste (Negoro, personal interview, 23 April 2014).
>
> At that time, there was an overloaded clothing donation in Muntilan [a sub-district in the Magelang district]. The evacuees didn't take the clothes. [The evacuees said,] "Our homes were not on fire, we still have our clothes and we still can get them at our homes" (Sundary, personal interview, 21 April 2014).

A volunteer of Lahara FM, Setyawan, gave another example of inappropriate aid. He mentioned a donation of high-voltage generators that apparently were incompatible with the residential electrical equipment and nearly caused a fire (personal interview, 20 March 2014). Similarly, a district officer, Iman, stated that there were some evacuees who needed rice and received eggs instead (focus group, 19 July 2014). Not only the individual donors, but the local government also made the same mistake. According to Setiyoko, a community member, the local governments often distributed aid to the affected community indiscriminately

without investigation about personal needs, while some community members may require specific aid or more aid than the others (personal interview, 8 July 2014). In other words, the local governments often overlook the individual needs and focus more on mutual needs based on formal policies in disaster responses. Meanwhile, an effective disaster response is one performed based on the specific needs of the affected community (IFRC, 2015).

In order to be able to share the specific disaster information about the affected community, the Jalin Merapi network closely engaged the evacuees, including the volunteers of the community radio stations to participate in its community-based disaster communication. In the case of the Jalin Merapi network, the affected community was eager to participate in the Jalin Merapi network because of the trust encouraged by the culture-embedded communication and the social network owned by the community radio volunteers, as discussed in Chapter Five. Again, by using the multiple media established in the local communication behaviours, the Jalin Merapi network provided a convenient means for the affected community to easily participate in providing, verifying, and sharing disaster information. In the next sub-sections, I discuss the community participation in providing and sharing information through the Jalin Merapi network in detail.

6.2.1. Community participation in information providing

In providing information about local disaster information, the Jalin Merapi network closely engaged the evacuees, including the volunteers of the community radio stations, as trusted information sources during the 2010 Merapi eruption. Similarly, Hindman and Coyle (1999) agree that community members are the first responders and simultaneously become crucial information sources in a disaster response. Particularly, the Jalin Merapi network encouraged and facilitated the participation of the affected community to provide their information about themselves and the area surrounding Mt. Merapi based on their personal experiences and visual and audio observations on what was happening in their surroundings to the Jalin Merapi network. The affected community, including the volunteers of the community radio stations, experienced the hazards themselves so they could provide accurate information about their surroundings. Negoro, a volunteer of Jalin Merapi agreed that the spatial proximity of the community radio volunteers to the Merapi hazards is an advantage for timely response in providing local information about Mt. Merapi whenever necessary, compared to the government offices which are situated far away from the Merapi summit (personal interview, 23 April 2014).

As previously mentioned in Chapter Five, the volunteers of the community radio stations set up field posts of the Jalin Merapi network in their surroundings in order to be able to continuously provide information about the affected community and the affected areas. In the field posts, Lintas Merapi FM and Lahara FM continued their on-air broadcast. A volunteer of Lahara FM described his broadcasting experience:

> Almost everyone listened to Lahara FM [...] [by the means of] handphone or radio [...] We continuously broadcasted information about the level of the lahar flood and its direction [...] When the lahar flood came, everyone had safely reached the shelter [...] Back then, the community radio station was extremely beneficial for the affected communities. The flood was huge and there were no victims [...] because of the information shared by Lahara FM [...] We were so grateful for the community radio station (Setyawan, personal interview, 20 March 2014).

Although MMC FM could not be on-air during the 2010 Merapi eruption, Mujianto, a volunteer of MMC FM, described what he did in order to be able to share information needed by the evacuees. He specifically stated:

> There was a rumor that Selo was destroyed. It created anxiety within the evacuees [...] I stayed [...] at Jalin Merapi's field post [...] at Selo [...] I did not evacuate [...] there were only four of us [...] I provided information about our village [...] they [the evacuees] could contact me to ask about their houses [...] We also guarded the road to prevent theft (personal interview, 26 April 2014).

In addition to the volunteers of the community radio stations, the other affected community members also provided their information to the Jalin Merapi network.

However, the participation levels in information provision varied among the affected community members, mainly depending on their access to communication technologies and the level of technology adoption during the 2010 Merapi eruption. At that time, most survivors utilized two-way radio (Walkie Talkie)[31] and SMS to provide their information, particularly about their needs, to the Jalin Merapi network. For those who could not access or use the communication technologies, the Jalin Merapi network became an alternative and trusted channel through which the evacuees could provide information. In practice, the field volunteers of Jalin Merapi (the community radio volunteers and the newly-recruited ones) personally gathered information from the evacuees every morning and afternoon. They went

[31] The local communities living on the slopes of MT. Merapi refer to a two-way radio as a Handy Talkie.

to the IDP camps, particularly those that were less exposed and isolated, to gather information about the evacuees' demography (name, address), their current health condition, their daily needs, and the condition of the area surrounding Mt. Merapi. Sundary, a volunteer of Jalin Merapi, explained the process:

> Sometimes, the evacuees came to the field posts of Jalin Merapi […] But, mostly, we came to the evacuees every day […] every morning we recorded their condition and needs for a day […] we updated the information onto our database, afterwards. The aid came […] we distributed the aid in the afternoon […] [At the same time when the aid being distributed], the evacuees told us again what they needed […] We updated our database again (personal interview, 21 April 2014).

The process of information gathering was challenging because of a lack of official data about the existing IDP camps (as previously discussed in Chapter Four). Additionally, the evacuees tended to move from one IDP camp to another; hence, the number of IDP camps most likely fluctuated. In this case, the involvement of the community radio volunteers (as the locals) was significant to identify the isolated areas that potentially became the unofficial IDP camps. In regard to this practice, the Harvard Humanitarian Initiative (2011, p. 39) agrees that 'to get information, you have to be on the ground. You have to walk around and ask people for it'.

The access to communication technologies and the level of technology adaption are not the only determining factors for the ability to provide information conveniently. I argue that the way the affected community was able to provide their information became a significant factor in participation. In the early stage of the 2010 eruption, the Jalin Merapi network initially tried to impose a strict format for information provision through SMS so the information could be automatically classified by the computerised system. Although the format may have been extremely useful for classifying incoming information, it did not work for the affected community, including the community radio volunteers. Dewi, a volunteer of the Jalin Merapi network, clearly explained the failure, as follows:

> W]e initially applied many codes in our SMS gateway […] type #, then *, then type the information and send it to Jalin Merapi's number […] Because we needed to archive it, so it would have been easier for classification […] The codes were socialised […] We printed the guidance of how to text messages on papers and stacked them at the post. It was easy! But apparently, our target audiences did not feel comfortable in using it […] When we applied the codes, no one used our SMS Gateway. It was blank! Even the volunteers felt that it was too complicated and they did not use it […] Finally, we gave up the format (personal interview, 26 March 2014).

Introducing a new way to communicate in community-based disaster communication does not necessarily guarantee the participation of the affected community, regardless of whether the new way is regarded as an effective tool by the people outside the affected areas who are trying to help. Similarly to the previous observations about the usage of multiple media based on existing local media usage, this finding also stresses the importance of adapting technologies to the existing local communication behaviours of the affected community to assure community participation in disaster communication.

As the result of the efforts of Jalin Merapi to facilitate community participation in information provision, the affected community members (including the community radio volunteers) were able to provide their specific information during the 2010 eruption. The information provided was about: the up to date condition of the Merapi volcano; hazards of Merapi (pyroclastic flows and secondary hazards such as lahars); the refugees' condition, numbers, demography, locations and needs (demand); the affected residents; the locations of IDP camps; aid distribution; and the needs for additional volunteers during the 2010 eruption. The types of information were listed by Asnawi, a volunteer of K FM, as follows:

> Our aims were to provide information about the evacuees' condition [and] their locations because lots of people wanted to deliver their aid directly to the evacuees […] Besides, we also provided information about the evacuees' needs […] through Twitter, Facebook, Jalin Merapi's website, etc. […] We also provided information about our needs for volunteers in certain posts. We needed volunteers to deliver [the logistics], to record [the information], etc. (Asnawi, personal interview, 21 March 2014).

In addition to the information listed above, the volunteers of the community radio stations, as members of the affected community, were able to provide knowledge about local hazards. This particular ability distinguishes Jalin Merapi's community-based network from other humanitarian organisations that do not directly engage with the disaster-affected community. Moreover, knowledge about local hazards is often unavailable in a disaster response. Hence, 'it is not uncommon, for example, for volunteers to rush to the scene of a disaster and actually impede the emergency response' (Reynolds and Seeger, 2005, p. 50). Therefore, the knowledge of local hazards is specifically valuable to protect untrained volunteers from outside the affected region from being the next victims, which is likely to happen in the disaster response stage.

During the 2010 eruption, the volunteers of the community radio stations assisted other new volunteers and donors in identifying the safe areas when they were gathering information or distributing aid to the refugees. The importance of the local knowledge was emphasized by a volunteer of K FM:

> Our community radio volunteers are really familiar with their surroundings […] It is impossible if they do not know. I myself know the 153 hamlets in this sub-district very well […] If volunteers are lost, we can know their positions just by explaining the characteristics of the road, the surrounding buildings, or even the trees! […] In the 2010 eruption, our [community] radio volunteers helped to coordinate and escort Jalin Merapi volunteers, because we were the only ones who really knew our surroundings […] We had important roles when the volunteers had to record the evacuees or distribute logistics in the field. We recommended them the way […] We knew which rivers had been frequently flooded with lahars […] If they were lost, we guided them via two-way radio […] Otherwise, like what happened in Mt. Sinabung, a volunteer died because of the pyroclastic flow. It might have been because they did not consult with the locals first. The locals know exactly how many bridges, which one is the safe road, where the shortcut is […] We know the risk if we choose a way […] The community radio volunteers know the information because we are the locals! (Asnawi, personal interview, 21 March 2014).

Additionally, the members of an affected community also can provide warnings about possible threats based on their local beliefs. The community's culture and geomythologies of volcanic hazards are based on concrete memories and direct personal experiences of previous eruptions (Cashman and Giordano, 2008, Cronin and Cashman, 2008, Donovan, 2010, Fischer, 2000, Troll et al., 2015), so community members can provide a warning of any possible threat based on the patterns of previous eruptions (Troll et al., 2015). The finding supports Jaeger et al. (2007) who found that the community members may help to identify an emergency and may help others avoid it. Also, the finding strengthens my previous argument that the cultural knowledge of the affected community can play an important role in community-based disaster communication. However, it is important to acknowledge that there are limits to cultural knowledge in predicting natural hazards, as demonstrated by what happened to Mbah Maridjan, the spiritual gatekeeper of Mt. Merapi, in the 2010 eruption (as discussed in Chapter one).

At the end of the process of providing information, the field volunteers of the Jalin Merapi network, including the volunteers of the community radio stations, delivered the useful

information provided by the evacuees to the volunteers located at the main post. They delivered the information by means of personal Twitter accounts by mentioning @jalinmerapi or direct messaging, personal Facebook accounts, the Jalin Merapi network's Facebook groups, Yahoo Messenger, email, two-way radio, and Google Docs. A volunteer of MMC FM, Mujiono, clearly described it:

> In the field post, I used my personal Twitter account and mentioned @jalinmerapi. We also used the Facebook group […] and SMS […] The information was shared further onto @jalinmerapi by the volunteers located at the main post [of the Jalin Merapi network] […] For example, "The evacuees in Selo need blah blah blah, for further coordination please contact Muji at this number" (a personal interview, 26 April 2014).

Unlike the most affected community members who preferred SMS, the volunteers preferred social media because it was considered more affordable. As an illustration, one of the Indonesian telecommunication operators charges 30 IDR (approximately 0.003 NZD) for 10 KB of internet data (Telkomsel, 2015a) and 175 – 200 IDR (approximately 0.01 – 0.02 NZD) for 1 SMS (Telkomsel, 2015b). Besides, social media are more suitable to deal with low bandwidth and unreliable internet access (Harvard Humanitarian Initiative, 2011).

6.2.2. Community participation in information sharing

The useful local information, which was provided by the evacuees and the field volunteers, was shared back to the affected community and the general public by the Jalin Merapi network through the integrated platform of media multiplexity. Prior to the process of information sharing, the volunteers located at the main post of the Jalin Merapi network had to extract easily-classified structured information from unstructured incoming information from the multiple media. That process has become the biggest challenge in community-based disaster communication (Harvard Humanitarian Initiative, 2011), because it often takes the form of endless organising over overloaded incoming information. Thus, the volunteers located at the main post of the Jalin Merapi network developed a mechanism to monitor the incoming media in order to be able to classify and share the useful provided information to the public, including the affected community.

Initially, all of the seven volunteers located at the main post of the Jalin Merapi network monitored the incoming information on all used media at the same time. They regarded the mechanism as chaotic eventually because each medium had information coming at different

rates. According to one of the volunteers, the rapid information change of social media was the most challenging issue (Dewi, personal interview, 26 March 2014). Responding to that particular challenge, they amended their mechanism of information monitoring. One volunteer was responsible for monitoring incoming information on the Facebook group and answering phone calls, one volunteer was responsible for monitoring incoming information on two way radio and the SMS Gateway, three volunteers were responsible for monitoring incoming information and sharing information on the Twitter accounts, and two volunteers were responsible for compiling the useful incoming information onto the Google Docs database. The latest mechanism was more effective in monitoring the overload incoming information than the previous one. Dewi, a volunteer located at the main post of the Jalin Merapi network, explained the working flows:

> I monitored the @jalinmerapi account. I often asked Uma [another volunteer] about where the logistic aid should be distributed. She would have checked the database of the evacuees' needs on the website, or asked for the information on the chat room of the Facebook group, or asked the field volunteers via land-line phone. Vice versa, she would tell us [the volunteers who were monitoring the Twitter account] about the evacuees' need, which was delivered via the Facebook group. So, it could be publicly published. Saiful, who was monitoring the situation of the Merapi volcano [via two-way radio], also helped us in replying to questions from the Twitter followers and the Facebook members (personal interview, 26 March 2014).

In order to be able to work effectively, the seven volunteers were strictly required to work in the same room in order to be able to exchange their information from the monitored media rapidly. This also means that the seven volunteers were reliant on face to face communication in filtering through the social media feeds.

The task distribution among the volunteers, who were located at the main post of the Jalin Merapi network, is called 'micro-tasking' which is regarded as effective for dividing large crowdsourcing processes into discrete tasks that only need a few minutes to complete each task (Harvard Humanitarian Initiative, 2011, p. 49). However, it requires a higher degree of auditing to ensure that no task is performed repetitively. Furthermore, the mechanism of micro-tasking in monitoring the information provided was also applied to the information sharing. I will further discuss the process of information sharing by referring to Hollingshead et al. (2007, p. 260) who defined 'information sharing' as a 'voluntary act of making information available to others…and includes plans about what information to share, how,

when, and to whom'. Specifically, I will start the discussion of information sharing in the Jalin Merapi network with 'what information to whom', followed by 'how to share the information', and 'when to share the information' accordingly.

6.2.2.1. What information to whom

In his interview, Nasir, a former Combine staff member who was based at the main-post of the Jalin Merapi network, defined information sharing in the Jalin Merapi network as a process of sharing the useful provided information (from the affected communities) to the general public (people outside the affected areas) and back to the affected communities through the media multiplexity (personal interview, 17 March 2014). This was supported by another Combine staff member who was based at the main-post of the Jalin Merapi network, Wijoyono, as he explained:

> The objectives was to provide accurate information about Mt. Merapi from the local people [...] We divided it into two sides. The local community with community media and people outside Mt. Merapi with online media [...] Both sides, all of them needed the information about Mt. Merapi [...] It was two-way communication. Not only from the locals to the people outside the affected areas. We also got some information from the vulcanologists, the meteorologist agency [...] we shared it to the community radio stations (personal interview, 17 March 2014).

The information shared through the Jalin Merapi network was the information provided by the affected community to the field volunteers (including the community radio volunteers) in advance. In general, the information was about the updated condition of the Merapi volcano; hazards of Merapi (pyroclastic flows and its secondary hazards such as lahars); the refugees' condition, numbers, demography, locations and needs (demand); the affected residents; the locations of IDP camps; aid distribution; and the needs for additional volunteers during the 2010 eruption. Setyawan, a volunteer of Lahara FM, explained:

> They (the evacuees) came to us and asked "I need this. Do you have it?" […] They also called [and] sent text messages […] We shared the information on social media. For example, they needed sanitary napkins. If we had them [at the field post], we gave them to them instantly. If not, we typed "The villagers at this hamlet need sanitary napkins". We shared it on the Twitter account of Jalin Merapi (personal interview, 20 March 2014).

With regard to the two different target audiences, the Jalin Merapi network shared the provided information differently based on the information demands of each audience type.

The discrepancy in information needs between an affected community and an unaffected community was clearly described by Zakaria, a community member, and Sundary, a volunteer of Jalin Merapi, as follows:

> If I were not a victim, I would have needed the information about how I could help […] If I were a victim, I would have needed the information about the safe and vulnerable areas, and the actions I should take (Zakaria, personal interview, 27 June 2014).
>
> The evacuees need the information related to their basic needs […] the people outside the affected areas who wanted to help often get confused over how and where to help. They also need to know whether their donations can be distributed soon (Sundary, personal interview, 21 April 2014).

Each audience has distinctive priorities of information demands. Ferrante (2010), Reynolds and Seeger (2005), and Sellnow et al. (2002) agree that disaster communication must be able to reduce uncertainty by providing timely, accurate, and helpful direct messages for the affected community. For those who are unaffected but worried, disaster communication must be able to reduce generalised anxiety and concern. In the following sub-sections I detail how Jalin Merapi shared distinct information to the general public outside the affected areas and back to the affected community.

6.2.2.1.1. Sharing to the people outside the affected areas.

The action of sharing information to the general public was mostly done by the seven volunteers located at the main post of the Jalin Merapi network. They mostly used the Twitter account @jalinmerapi because it was considered to be able to accommodate the demand for timely information.

Figure 23. An example of Jalin Merapi's tweets

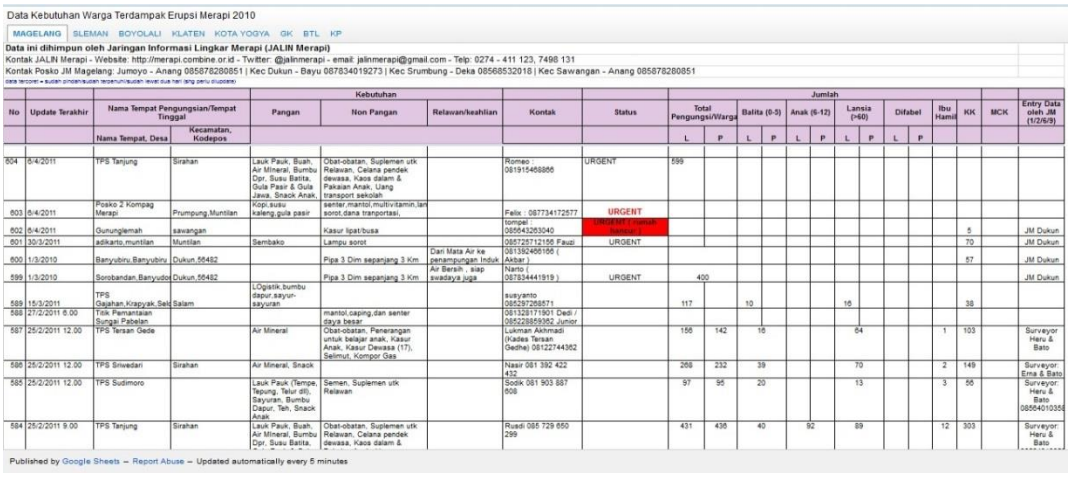
However, Twitter was not the only medium for sharing the provided information to the general audience. The wider audiences could directly read the running text of the SMS sent by the affected communities, listen to the audio streaming of two-way radio conversations, and access the Google Docs on Jalin Merapi's website.

Basically, the information shared with the people outside the affected areas was the information provided by the affected community to the Jalin Merapi network, as explained by a Combine staff member who was based at the main-post of the Jalin Merapi network below:

> Information about Mt. Merapi has been mainly sourced from mass media. The characteristics of information will be different between [the information] shared by the community and that published by mass media. So, we made a bridge between the insider and the people outside the affected areas […] We collected the local information and published it online. So, people outside Mt. Merapi could know what was happening in Mt. Merapi from the view of the local people (Wijoyono, personal interview, 17 March 2014).

Particularly, the information sharing focused on the needs of the evacuees; the volunteers located at the main post of the Jalin Merapi network classified that particular information as the "Demands". It was particularly useful because without a trustworthy direct channel of communication with the affected community, individual donors had difficulty finding information about about the specific needs of the evacuees and the locations of the affected areas where the evacuees needed particular forms of aid during the 2010 eruption. Moreover, they hesitated to contact the local government because they were unsure whether the local government would have been willing to accept and distribute personal donations which were more likely to be quantitatively less than the institutional donations.

The information about the needs of of the affected community (the demands) was compiled on the Google Doc of "Demands of Merapi eruption-affected communities 2010" (*Data kebutuhan Warga Terdampak Erupsi* 2010) before being shared with the general public. Agustina, a volunteer of the Jalin Merapi network, explained that the Google Doc became a continuously updated database for aid distribution to set priorities of demands and avoid overlapping aid (personal interview, 12 May 2014). It was a matrix template of compiled information about the detailed location of IDP camps, demands including detailed contact and its urgency, and demographic information (e.g. numbers of toddlers, children, the elderly, persons with disabilities and pregnant woman) of the evacuees in each IDP camp.



Data Kebutuhan Warga Terdampak Erupsi Merapi 2010

MAGELANG SLEMAN BOYOLALI KLATEN KOTA YOGYA GK BTL KP

Data ini dihimpun oleh Jaringan Informasi Lingkar Merapi (JALIN Merapi)

Kontak JALIN Merapi - Website: http://merapi.combine.or.id - Twitter: @jalinmerapi - email: jalinmerapi@gmail.com - Telp: 0274 - 411 123, 7498 131

Kontak Posko JM Magelang: Jumoyo - Anang 085878280851 | Kec Dukun - Bayu 087834019273 | Kec Srumbung - Deka 08568532018 | Kec Sawangan - Anang 085878280851

data terpolah + sudah pindah/sudah tergantikan level dua hari lalu perlu diupdate)

No	Update Terakhir	Nama Tempat Pengungsian/Tempat Tinggal		Kebutuhan			Kontak	Status	Jumlah												MCK	Entry Data oleh JM (1/2/6/9)
		Nama Tempat, Desa	Kecamatan, Kodepos	Pangan	Non Pangan	Relawan/keahlian			Total Pengungsi/Warga		Balita (0-5)		Anak (6-12)		Lansia (>60)		Difabel		Ibu Hamil	KK		
									L	P	L	P	L	P	L	P	L	P				
604	6/4/2011	TPS Tanjung	Sirahan	Lauk Pauk, Buah, Air Mineral, Bumbu Dpr, Susu Balita, Gula Pasir & Gula Jawa, Snack Anak,	Obat-obatan, Suplemen utk Relavan, Celana pendek dewasa, Kaos dalam & Pakaian Anak, Uang transport sekolah		Romeo : 081915468866	URGENT	599													
603	6/4/2011	Posko 2 Kompag Merapi	Prumpung,Muntilan	Kopi,susu kaleng,gula pasir	senter,mantol,multivitamin,lan sorot,dana tranportasi,		Felix : 087734172577	URGENT														
602	6/4/2011	Gunungilemah	sawangan		Kasur lipat/busa		tompel : 08564263040	URGENT (Hamil+ Balita)												5		JM Dukun
601	30/3/2011	adikarto,muntilan	Muntilan	Sembako	Lampu sorot		085725712156 Fauzi	URGENT												70		JM Dukun
600	1/3/2010	Banyubiru,Banyubiru	Dukun,56482		Pipa 3 Dim sepanjang 3 Km	Dari Mata Air ke penampungan Induk	081392466166 (Akbar)													57		JM Dukun
599	1/3/2010	Sorobandan,Banyudoi	Dukun,56482		Pipa 3 Dim sepanjang 3 Km	Air Bersih , siap swadaya juga	Narto (087834441919)	URGENT	400													JM Dukun
589	15/3/2011	TPS Gajahan,Krapyak,Sele	Salam	LOgistik,bumbu dapur,sayur-sayuran			susyanto 085297268571		117		19				16					38		
588	27/2/2011 5:00	Titik Pemantauan Sungai Pabelan			mantol,caping,dan senter daya besar		081328171901 Dedi / 085228859362 Junior															
587	25/2/2011 12.00	TPS Tersan Gede		Air Mineral	Obat-obatan, Penerangan untuk belajar anak, Kasur Anak, Kasur Dewasa (17), Selimut, Kompor Gas		Lukman Akhmadi (Kades Tersan Gedhe) 08122744362		156	142	16				64				1	103		Surveyor Heru & Bato
586	25/2/2011 12.00	TPS Sriwedari	Sirahan	Air Mineral, Snack			Nasir 081 392 422 432		269	232	39				70				2	149		Surveyor Erna & Bato
585	25/2/2011 12.00	TPS Sudimoro		Lauk Pauk (Tempe, Tepung, Telur dll), Sayuran, Bumbu Dapur, Teh, Snack Anak	Semen, Suplemen utk Relavan		Sodik 081 903 887 608		97	95	20				13				3	55		Surveyor Heru & Bato 08554010358
584	25/2/2011 9:00	TPS Tanjung	Sirahan	Lauk Pauk, Buah, Air Mineral, Bumbu Dpr, Susu Balita,	Obat-obatan, Suplemen utk Relavan, Celana pendek dewasa, Kaos dalam &		Rusdi 085 729 650 299		431	436	40		92		89				12	303		Surveyor Heru & Bato

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Figure 24. "Demands of Merapi eruption-affected communities 2010" Google Doc

Specifically, the information about demand compiled in the Google Doc was shared on the website of the Jalin Merapi network, so it could be accessible to the general public. As a data base, the general audiences could simply access the compiled information on the Google Doc and did not necessarily need to gather scattered information to get the most updated and detailed information. Moreover, according to a volunteer of Jalin Merapi, potential donors could easily decide what they could help with and where because the compiled information was already divided based on the sub-districts (the location) (Widyarsi, personal interview, 27 May 2014).

6.2.2.1.2. Sharing back to the affected community

Unlike the information sharing with the general public that was mostly done by the volunteers located at the main Jalin Merapi post, information sharing back to the affected communities was mostly done by the field volunteers, particularly the volunteers from the community radio stations. Similarly to the role of the volunteers of the community radio stations in providing the evacuees' information to the Jalin Merapi network, the community radio volunteers also acted as message couriers to deliver information back to the evacuees, utilizing their personal social networks to share the information with their eruption-affected friends and families. Additionally, they engaged the community information nodes, the people considered to be reliable by other community members, as the initial points in forwarding information to the rest of the community members. The role of the community radio volunteers as information couriers in bridging information from the people outside the affected areas to the evacuees strengthens the argument about the importance of engaging local actors in disaster communication.

Moreover, I argue that the process of information sharing through Jalin Merapi demonstrates that it is important to engage local people who are physically present in the affected areas in disaster communication. By being in the affected areas, the community radio volunteers could engage in face-to-face communication with the evacuees, which made the process of information sharing back to the affected community more effective than using SMS or two-way radio. The effectiveness of word-of-mouth communication through a face-to-face meeting was emphasized by some interviewed community members; they specifically considered that the particular traditional way of communication, known as *Getuk Tular*, is still the most effective method because information can be shared with someone they know immediately (Adji, 22 July 2014; Supadi, 22 July 2014). In a similar fashion, Wulandari, another community member, described that 'many prefer seeking information at the *Poskamling* [the neighbourhood watch post]' through a face-to-face meeting. Not only at the community level, but a head of a village, Yatin also described that traditional communication built upon offline relationships is more resilient, because a disaster always disrupts the network systems of the communication technologies (focus group, 19 July 2014). Supporting the argument that face-to-face communication is important in disaster communication, Austin et al. (2012), Harvard Humanitarian Initiative (2011), Ryan (2013), and Romo-Murphy et al. (2011) found that person-to-person communication, particularly word of mouth through face-to-face interaction, is the primary source of local disaster information right after a disaster strikes; additional sources of information such as local authorities, social media, and mass media tend to be used afterwards. More importantly, face-to-face communication provides 'the cronic monitoring of the gaze, bodily posture, and gesture', which can confirm the trustworthiness of information (Giddens, 1990, p. 99).

During the 2010 Merapi eruption, the disaster information shared with the Merapi people mainly consisted of three types of information: official information about Mt. Merapi's status from *Balai Penyelidikan dan Pengembangan Teknologi Kebencanaan Geologi* (Center for Investigation and Technology Development of Geological Disasters – BPPTKG), community-generated information about lahars from the two-way radio users, and information about aid supplies from donors. The types of shared information reflected the information needed and valued by the affected community. In particular, prioritising information about the hazards of eruption and lahars matched the previous studies of Mt. Merapi (Thouret et al., 2000, Voight et al., 2000, Dove, 2008, Surono et al., 2012, Triyoga, 1991) and the local knowledge that pyroclastic flows and lahars (cold lava flows) are the most dangerous hazards of Mt. Merapi.

Moreover, the affected community already considered the BPPTKG as the most reliable information source about the Mt. Merapi eruption and the users of two-way radio (regardless of the controversy about its information accuracy) as the most reliable information about lahars. Based on the finding, I argue that it is important to acknowledge the compatibility of the shared information with the needs of the affected community in sharing information to them and, at the same time, refer the shared information to an information source that is regarded as reliable and trustworthy by the affected community. I detail the process of sharing of each type of information in the following discussions.

Firstly, the Jalin Merapi network sought official information from the BPPTKG vulcanology research unit and shared the official information to the affected community accordingly. During the 2010 Merapi eruption, the volunteers located at the main post of Jalin Merapi actively requested official information from BPPTKG by means of SMS, phone calls, and its official website. They also consulted visual field observations on Mt. Merapi provided by the affected community with the BPPTKG. The responses of and data gained from the BPPTKG were shared back to the affected community through the volunteers of community radio stations. Throughout these processes, the Jalin Merapi network informally conveyed the official information to the affected communities. The aim to share official information to the affected community was acknowledged by Supadi, a community member, who stated, 'The radio will coordinate with the BPPTKG. We just need to ask the [broadcasters of] radio station.' (personal interview, 27 April 2014).

The finding that the Jalin Merapi network shared the official disaster information from the BPPTKG to the affected community strengthens my previous argument in Chapter Four that official disaster communication cannot be simply disregarded by the affected community, regardless of how much the trust in official channels has been undermined. Almost all the interviewed community radio volunteers and volunteers of Jalin Merapi claimed that they only referred to the information released by the BPPTKG volcanology research unit and disregarded the other government agencies. Widyarsi, a volunteer of Jalin Merapi, stated that the regional government could be a valuable information source for community-based disaster communication. She explained further that she gained useful disaster information from the website of the Sleman government (e.g. detailed information about distribution of the IDP camps in the Sleman districts, name lists of evacuees in a particular IDP camp, lists of missing persons, the lists of casualties, and evacuees' movements on specific dates). She specifically stated:

> If someone asked about his/her missing family [members] […] I browsed the website of the Sleman Government […] it had (information about) who moved to where, who were in a particular post […] I think [the website of] Sleman [district] was good […] and updated […] It had the information about locations of all IDP camps in Sleman […] this village evacuated to which village […] It also had the information about death and re-evacuation […] I could further recommend someone who asked for the information (personal interview, 27 May 2014).

Although the local governments had useful information resources, the Jalin Merapi network did not seem to make the most of the official resources. Presumably, the community's perceived lack of trust in the official disaster communication, as discussed previously in Chapter Four, had influenced the way the volunteers of the Jalin Merrapi network, particularly the volunteers of the radio community stations, did not prioritise the official channels as their information sources during the 2010 eruption. This finding also strengthens the argument about the significance of the role of the community's perceived trust in disaster communication. Yet, despite the emphasis on community-based information networks, it is important to acknowledge that other stakeholders still have a valuable role. Principally, other involved stakeholders, including the government agencies, are still required in order to establish effective information sharing in disaster response.

Secondly, the Jalin Merapi network shared information about lahars, which was mostly provided by the users of two-way radio, to the affected community. To gather information about lahars, these users often directly observed river banks and shared their observations with their internal networks including the community radio volunteers. Furthermore, the community radio volunteers shared the information generated by two-way radio users about lahars with the rest of the community members, both through the community information nodes and SMS. Moreover, the Jalin Merapi network relayed and streamed some frequencies of local two-way radio on the website of Jalin Merapi. The audio streaming successfully extended the one-to-one-point characteristic of two-way radio to be one-to-many point information sharing. This was not only useful for the affected community members who did not have direct access to two-way radio, but also for the general public outside the affected areas. The general public could also directly listen to the local conversations from the affected areas by the Merapi people themselves.

Thirdly, the Jalin Merapi network shared information about available aid supplies, which were previously provided by donors, to the affected community. In practice, the Jalin Merapi

network connected the "supplies" from the general public to the "demands" of the affected community, even for the smallest and most uncommon; this was clearly explained by Widyarsi, a volunteer of the Jalin Merapi network:

> At first, we were not sure about publishing demands for "small" stuff […] We shared it anyway […] Surprisingly, people responded to it […] People sent us food […] funds […] used clothes […] groceries […] radio equipment […] vegetables […] pasture for livestock […] water pumps […] rain coats […] mobile credit for volunteers […] four-wheel [drive] cars for evacuation […] people offered lifts to deliver donations from Jakarta […] someone offered his house for temporary accommodation to some medical students who wanted to help the refugees […] and much more (personal interview, 27 May 2014).

In the case of Jalin Merapi, the supplies were not solely related to funding and tangible donations; they also included information about health services, trauma healing, the distance between the evacuees and the Mt. Merapi summit, and available venues for temporary IDP camps.

The information sharing about aid supplies started when the affected communities were instructed to re-evacuate for the third time, to 20 kilometres away from the Mt. Merapi summit. At that time, most evacuees did not know whether they needed to re-evacuate because they did not know the distance between their initial IDP camps and the Mt. Merapi summit. In responding to the absence of official information, the volunteers located at the main post of the Jalin Merapi network, who acted as the people outside the affected areas in comparison to the community radio volunteers, shared information about the distance between the evacuees and the Mt. Merapi summit. Nasir, a former Combine staff member who also participated as a volunteer of Jalin Merapi during the 2010 eruption, explained:

> When the safety zone was extended to 20 kilometres, lots of people asked […] "Do we have to re-evacuate or not?" We asked their locations […]We could not find the hamlets on Google Maps. So we bought a huge map and adhered it on the wall [at the main post of the Jalin Merapi network] […] We checked their locations [on the map], we checked their distance from the Mt. Merapi summit and the nearest river. In 10 minutes, we answered them (personal interview, 17 March 2014).

Similarly to the distance-related confusion, there was also an absence of detailed information about where and how to re-evacuate. According to a community member, most of the affected community members asked, 'where do we [re]evacuate?' (Gimar, personal

interview, 8 July 2014). Moreover, another community member, Setiyoko, added that the authorities were too slow in providing vehicles for re-evacuation; hence, people re-evacuated independently by their personal means of transportation and were organised by the informal leaders (personal interview, 8 July 2014). Subsequently, the Jalin Merapi network shared the information about the available venues for temporary IDP camps such as university halls, schools, sports stadiums, etc. to address their questions about where to re-evacuate and the information about available vehicles to transport the evacuees.

The way the Jalin Merapi network treated information as a form of aid stands out from the focus of most humanitarian activities on tangible donations in helping the affected community in a disaster response. Providing numerous tangible donations frequently challenges community-based responses with limited resources, particularly those organised by the affected community themselves; the people outside the affected areas are the ones who are most likely to be able to provide the tangible donations needed by the affected community. Yet, the Jalin Merapi network showed that assisting an affected community does not necessarily require the ability to provide what the affected community needs; mediating between those who are able to provide the tangible aid and the affected community by sharing the information about the aid supplies can be very helpful.

In summary, the way the Jalin Merapi network shared different information to different target audiences emphasises the importance of distinguishing shared information based on the specific demands of the affected community and the general public. I argue that this thesis may be able to take a position in the debate on crisis communication theories about whether identifying the unique vulnerability of different communities matters in deciding effective crisis communication strategies (Fronz, 2012). Taking the side of the scholars who consider it important to identify audiences based on their unique vulnerability, the thesis argues that disaster communication needs to distinguish information being shared to different targeted communities because each community has their unique information needs based on their unique vulnerability .

6.2.2.2. How to share disaster information

The Jalin Merapi network applied a cross-posting strategy to ensure that the shared information was accessible to all targeted communities (the general public and the affected communities). The main principle of the cross-posting strategy was to correlate information from one medium to the others. The information provided on one particular medium by the

affected community or the field volunteers, was shared further on the other media by the main volunteers. Conversely, the information provided on the other media by the affected community or the field volunteers, was used to respond to the information on that particular medium.

For instance, the information on the Facebook groups was summarised into notes and published on the website of Jalin Merapi; later, the links of notes were shared on the Facebook and Twitter accounts. A volunteer of K FM, Santosa, explained:

> When information came from a field post, it was posted on one [Facebook group] and copied to other groups […] manually […] A conclusion of a conversation was "converted" into a note, then shared […] We had certain community radio volunteers in each group as the controllers […] All valid information was shared with all groups, not being compiled on one particular group (personal interview, 21 March 2014).

Again, the information from the two-way radio and the SMS gateway was shared on the Facebook and Twitter accounts. All incoming SMS was displayed as running texts on the website of Jalin Merapi, so they could be read publicly. The information from the Twitter account was shared on the Facebook groups, and vice-versa.

However, the strategy of cross-posting created another challenge in translating the "language" of each medium to the others. For example, Twitter and Facebook have distinct information characteristics, where Twitter messages are limited to 140 characters, Facebook allowed longer and detailed messages (Potts et al., 2011, Karimi et al., 2013). Cross-posting a Facebook message onto Twitter requires the skill to modify a long and detailed message into 140 characters without losing its key information. Similarly, skill is also required to translate the specific terms used by the users of two-way radio into daily language that can be understood by the people outside the affected areas. This challenge needs to be acknowledged as it may delay the process of information sharing despite the demand for timely information in a disaster response.

The cross-posting strategy seems to have created a huge workload; nonetheless, it was effective to emphasise message prominence and increase message exposure. Similarly, Austin et al. (2012) and Dougall et al. (2008) agree that despite the redundancy, transmitting the same key messages across multiple platforms is effective in encouraging audiences to be more responsive to disaster information. Moreover, the strategy of cross-posting ensured that all useful provided information was accessible through various media in the media

multiplexity of Jalin Merapi. Hence, both the affected community and the people outside the affected areas could participate through their own media preferences. The cross-posting strategy fits Jaeger et al.'s (2007) suggestion that a community-based response needs to be supported by multiple technologies that provide the same vital information in different formats that best fit the media.

6.2.2.3. When to share information

In addition to the distinctive information demands of both the affected community and the general public, the information demands shifted to adapt to the changes in the volcanic hazards. I summarise the statements of the research participants in Table 4 below to describe the distinctive demands of the affected community and the general public from time to time during the response stage to the 2010 eruption.

Time	Affected Community[32]	General Public[33]
Before an eruption	The most updated status and recent condition of Mt. Merapi.	The most updated status and recent condition of Mt. Merapi.
Right after an eruption	The most updated status of Mt. Merapi; casualties; evacuees' condition; affected areas; possibility of following eruptions as the consideration for the next action of evacuation (necessary or not, where and how).	Information about certain areas where their families and friends live.
During the eruptions and evacuation process	Affected/vulnerable area; damages; casualties; evacuees; evacuation routes; locations of IDP camps; emergency bags; transportation means and fuel for evacuation; demands for food, clothes, and blankets.	Affected/vulnerable area; evacuees' condition; mechanism of donation (Supply); aid distribution; mechanism of voluntary participation; locations of those who needed help.
After the eruptions	Aid distribution; evacuees' needs; missing persons; physical and psychological recovery; demand for food ingredients, clothes, blankets, and activities; condition of livelihood, farms, livestock; time when they can feed their livestock; time when they can go home for their daily activities. After the eruption, the information of Merapi status was not mostly required. The refugees gained the information of	Missing persons; mechanism of donations (Supply); aid distribution; how they can voluntarily participate as volunteers; report of aid distribution After the eruption, the information of Merapi status was mostly not required. The unaffected could get

[32] I classified the information about the information demands gained from the local government officers, the community members, and the community radio volunteers into the category of the types of information demands of the Merapi people, as the affected communities.

[33] I classified the information about the information demands gained from the Combine staff members and the Jalin Merapi volunteers into the category of the types of information demands of general public, as the unaffected communities.

	the most updated status of Merapi, from the closest posts to their IDP camps.	the updates from the mass media.
Lahars stage	Lahars flows and their level; traffic updates and road blockages; logistic aid (Demand) for food ingredients and water pumps.	Traffic conditions and updates on roads that might have been blocked by lahars.

Table 4. Information demands of the affected communities and the general public in the Jalin Merapi network

Unlike the other natural disasters that mostly have one certain hazard to be dealt with, a volcanic eruption, such the Mt. Merapi eruption, can involve developing and changing hazards in the response period. An eruption of Mt. Merapi typically has two main hazards such as the pyroclastic flows and lahars that threaten lives in in the area around the mountain (Thouret et al., 2000, Voight et al., 2000, Dove, 2008, Surono et al., 2012, Triyoga, 1991). After an eruption resulting in pyroclastic flows and a bursting out of volcanic material, the erupted material build up can cause lahars. If an eruption happens during a rainy season, the volcanic material is often turned into a mudflow, as happened in the 2010 eruption (see the Introduction for the subsequent events of the 2010 eruption). During the 2010 eruption, the changing hazards in turn required changing information needs for the affected community and this strongly influences the type of shared information in disaster communication accordingly. In other words, the types of information shared in the Jalin Merapi network were not constant and depended on the demands for information of their target audiences. In a similar fashion, Moody (2013) also identified changes in information demands during the disaster response to Hurricane Katrina in 2006.

Based on the findings, I argue that it is important to acknowledge the changing information demands in different time frames during a disaster response. The argument is particularly important due to the lack of acknowledgement in other studies that information needs change during a disaster stage, particularly in the response period. Most existing studies of disaster communication do not identify different hazards during a response period, and often distinguish information demands in disaster communication only based on the crisis type and the disaster stages. For example, most studies have acknowledged that the public need for information in the stage of disaster preparedness is different from their need in the stage of disaster response; also, the public need for information when responding to an earthquake is different from their need when responding to a tsunami (for example, the studies of Reynolds and Seeger, 2005 and Seeger et al., 2003). Yet, the changing demands for distinct disaster information during a single disaster stage, particularly the disaster response, have been less explored. Therefore, I argue that acknowledging the change of information demand by the

target audience in a particular time frame is necessary to determine the type of disaster information to be shared in disaster communication. This builds on the previous argument that flexibility is required in disaster communication; it is not limited to the flexibility of media usage, but includes message design in order to adapt to the information demand of the target audience in a particular time frame.

6.3. Conclusion

During the 2010 eruption, the Jalin Merapi network was recognised for its ability to provide local information from the affected community, particularly information about specific types and quantities of aid required by individuals in the areas around Mt. Merapi, to the general public. At the same time, the Jalin Merapi network was able to provide information from outside the affected area, particularly information about available aid, from the general public to the affected community. In order to be able to do so, the Jalin Merapi network closely engaged the participation of the affected community, used an integrated platform of media multiplexity based on local communication behaviours, and benefited from the personal social networks owned by the community radio volunteers. Specifically, the community radio volunteers bridged the information provided by the affected community to the outside, and shared outside information back to the affected community by harnessing their offline pre-existing networks and media with which the affected community was already familiar. Simultaneously, the Jalin Merapi network shared the information of the affected to the general public by the means of internet-based media.

I summarise the community participation in providing and sharing information within the information flows of the Jalin Merapi network as below.

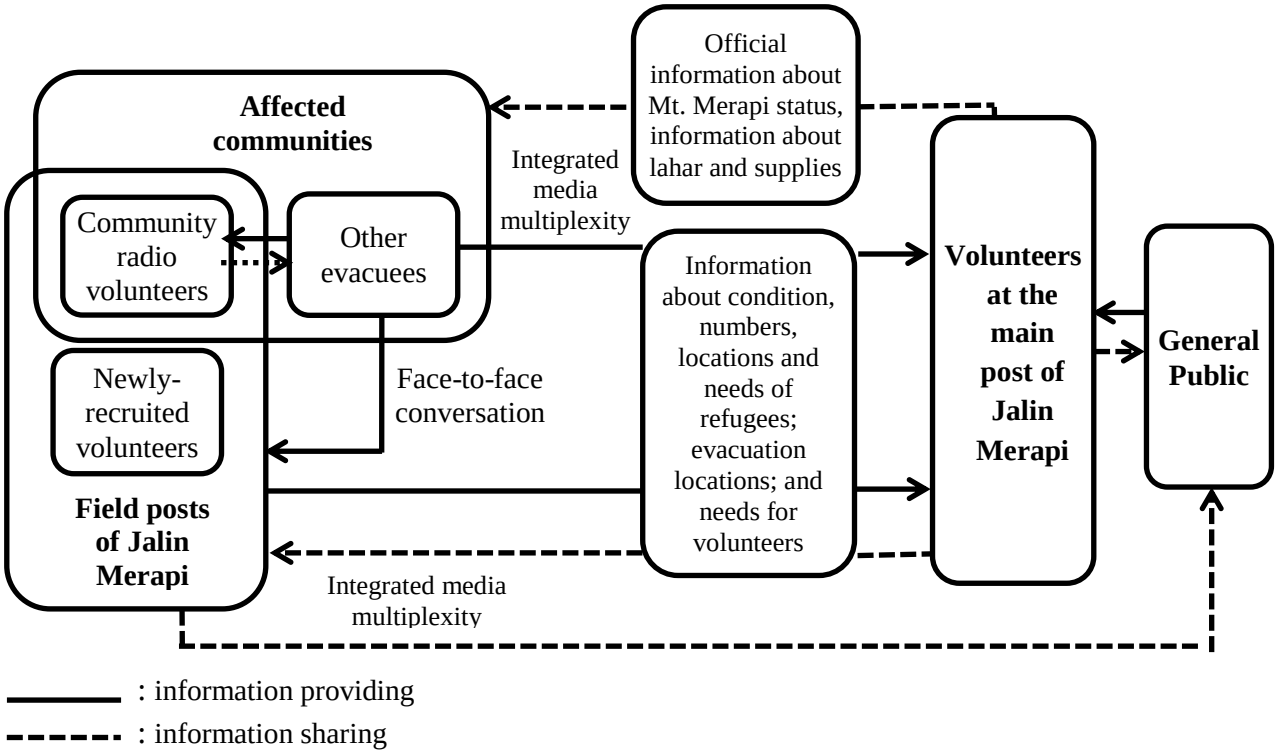

Figure 25. Information providing and sharing in the Jalin Merapi network during the 2010 Merapi eruption.

Addressing the third research question regarding community participation in disaster communication, this chapter has explained that the mechanisms of community participation in providing and sharing local disaster information through Jalin Merapi represent a networked approach, which is significantly different from the command-and-control approach used by the authorities in formal disaster communication. Community participation in providing and sharing information was built on existing media multiplexity and existing local social networks. By combining those two, Jalin Merapi was able to facilitate detailed information about the affected community, which is often only exchanged within their personal networks locally, to people and organisations outside the affected area, who may be able to respond to the information effectively through many-to-many communication forms. The Jalin Merapi network also benefited from the trustworthiness that was embedded in the personal networks of the engaged community radio volunteers. In other words, the Jalin Merapi network allowed the affected community to participate conveniently in a familiar

friend-to-friend network model and with familiar media. At the same time, the Jalin Merapi network scaled up their participation enormously by engaging internet-based media.

This research does not suggest that the exact platform of communication technologies used by the Jalin Merapi network is transferable to other affected communities, because each community has particular local media preferences that may differ from one community to the other. More importantly, I emphasise the value of community participation that is rooted in existing local social networks and unique local communication behaviours in disaster communication. Using appropriate communication technologies can empower local social networks to effectively promote resident-to-resident assistance and foster a coordinated emergency response throughout a community (Jaeger et al., 2007). In turn, community participation can strengthen the trustworthiness of community-based disaster communication.

Chapter Seven

Information verification for trustworthiness

> Along with that toolkit, and the standards and processes that inform how we use the tools, there is also the critical element of crowdsourcing: bringing the public into the process and working with them to ensure we all have better information when it matters most (Silverman & Tsubaki, 2014, pp. 11-12)

Community-based disaster communication is often perceived as untrustworthy because of a combination of excess information, myriad information sources, and a lack of aggregation and validation mechanisms (Gao et al., 2011, Austin et al., 2012, Crowe, 2012, Harvard Humanitarian Initiative, 2011). Because of the perception that community-generated disaster information is unorganized and unverified, Chapter Four argued that the authorities tend to perceive community-generated information as unreliable based on their institutional logic of information verification. This has led to a lack of trust and community engagement in disaster communication by the authorities. Despite this institutional mistrust, community-generated disaster information, particularly facilitated by social media, has grown considerably in the aftermath of recent disasters. Attempting to make the best use of community-generated information in disaster response, some volunteer tech communities have developed and used internet-based communication technologies such Ushahidi and the OpenStreetmap to collect and classify the overloaded crowdsourcing into easily-identified information for the general public. However, verifiying the considerable quantity of crowdsourced information is still the biggest challenge.

Experts have increasingly used advanced computing to verify information posted on social media (Silverman and Tsubaki, 2014), and this has shown both 'promises and pitfalls' recently (Meier, 2014, p. 78). This process seems to focus on verifying the community-generated information shared on social media and overlooks the information provided through other more traditional media such as SMS and two-way radio, as the advanced verification tools cannot be automatically applied to verify community-generated information through those older media. Therefore, this chapter addresses the challenge of developing a verification mechanism for community-generated disaster information that can be applied to multiple media in disaster communication. Specifically, this chapter starts with a discussion of how the Jalin Merapi network verified the information provided by the affected

community during the 2010 Merapi eruption. This chapter also presents a discussion of the protocols of information sharing applied by the Jalin Merapi network to maintain the validity of its information. The discussion is followed by an explanation of how the community-based verification mechanisms of the Jalin Merapi network contrast with the verification mechanisms of the local governments in the regions around Mt. Merapi. This chapter ends with a discussion of the compatibility of the community-based verification mechanisms of the Jalin Merapi network with individuals' perspectives on verified disaster information, which evidently encouraged trust from the affected community and the general public in the Jalin Merapi network during the 2010 Merapi eruption.

7.1. Community participation in information verification

Although the information shared through the Jalin Merapi network was provided directly by the Merapi people, who are often considered to be the reliable "insider" information sources because they personally experienced the eruption, verification was still necessary to guarantee validity, because of the possibility that an affected community would exaggerate information under an extreme stress situation (Harvard Humanitarian Initiative, 2011). Therefore, the Jalin Merapi network implemented two verification mechanisms, which were public and internal verification. I will discuss how each mechanism was implemented by Jalin Merapi's volunteers and the community radio volunteers in order to verify the information provided to the Jalin Merapi network during the 2010 Merapi eruption.

Firstly, the Jalin Merapi network closely engaged the participation of the affected community as information verifiers in its mechanism of public verification. In his interview, a volunteer of Gema Merapi FM explained that the affected community was involved as 'significant others' to ensure the accuracy of the information shared by the Jalin Merapi network (Ferdana, personal interview, 11 March 2014). The survivors voluntarily clarified any inaccurate information they saw on or heard from the Jalin Merapi network. The voluntary verifiers were often those who lived at or near the location associated with the information and able to quickly investigate the facts. The community's ability to verify information was facilitated by the openness of the information of the Jalin Merapi network; Wijoyono, a Combine staff member who also participated as a volunteer of the Jalin Merapi network, explained, 'We were using open data. All information had a contact person […] So people can verify the information by themselves' (personal interview, 17 March 2014). Regarding

the argument that the affected community can verify information shared in disaster communication, Crowe (2012, p. 129) labels the particular process of information verification as 'social validation' and the 'self-correction mechanism of collective wisdom'.

In addition to the voluntary verification performed by the affected community, the general public, particularly donors, also performed voluntary verification on the information about aid distribution and demand. Referring to the information shared by the Jalin Merapi network, some donors personally distributed their aid to the evacuees and simultaneously checked whether the person-in-need associated with particular pieces of information actually required the aid. There were some cases during the 2010 Merapi eruption when people were proven to have provided false information, particularly about logistic needs. Two volunteers of the Jalin Merapi network, Nasir and Zulivan, gave examples of information verification by donors:

> At that time, Magelang had a blackout for two weeks. The demand for generators was really high […] There was someone who initiated donations of generators […]He tweeted 'there is a fraud over generators in Krinjing [a village in Magelang district]. I didn't directly re-tweet it because it was suspect information. I asked his contact number […] to ask further […] about the chronology […] He told me that his team surveyed the village where someone requested generators via Jalin Merapi. They were convinced that he really needed them. When they delivered the generators the next day, they incidentally found out that there was a pile of logistic aid and generators at the back of the house […] I re-tweeted the information about the fraud […] So, the donors also shared that kind of information [the information about fraud the donors revealed] […] they have a similar interest (Nasir, personal interview, 17 March 2014).

> The verification also came from the crowd of Twitter or Facebook. For example, someone said that they needed hay. Then, someone else responded that he/she had hay and had gone there. But, the donor found out that the person was lying. They did not need the hay. They just wanted to sell it, maybe. So, the donor tweeted it (Zulivan, personal interview, 17 March 2014).

Secondly, the Jalin Merapi network involved its volunteers (again, including the community radio volunteers) as internal information verifiers. Two volunteers of the Jalin Merapi network, Wijoyono and Nasir, explained the internal information verification, as follows:

> For our verification system, our key persons were the community radio people in the field […] We could confirm any information with them and

> the volunteers in the posts. The information was not only about [Mt Merapi's] condition, but also about demand and donations. In the office [the main post of Jalin Merapi], we had a team for verification purposes […] made calls for donation verification. Of course, we could not verify one by one but we had a team for that purpose [verification] (Wijoyono, personal interview, 17 March 2014).

> The volunteers of the nearest field post of Jalin Merapi [including the volunteers of the community radio stations] were the verifiers. "There is someone who said that they need ABCD, this is his number, this is his location, please check" […] They reported the result of the verification […] The other verifier was *Ibu* Wid […] She was one of the volunteers [located at the main post of the Jalin Merapi network] […] She called the information sources […] She could identify whether the person was lying or not, even from the way he was talking. If she wasn't sure, she asked the field volunteers to check it on the spot […] She was right many times (Nasir, personal interview, 17 March 2014).

The role of community radio stations in information verification has been barely discussed in previous studies on them, however the community radio volunteers (as parts of the affected community) have an important practical role as information verifiers in a disaster response. In the case of the Jalin Merapi network, they acted as the field focal points with access to the real situation on the ground. In practice, the community radio volunteers extended the verifiers networks with their personal networks on the ground, so the process of information verification could encompass all areas surrounding Mt. Merapi. As locals, Haji, a volunteer of K FM, explained that the community radio volunteers knew exactly what was happening in their surroundings and had personal relationships to fill in the "blank spots" of information sources. He further stated that the community radio volunteers could check the information accuracy with someone they knew who lived in the area associated with the information, based on the trust in their personal relationships (personal interview, 21 March 2014). As a result, another volunteer of K FM explained that the community radio volunteers became the contact persons on the website of Jalin Merapi, so the wider audience members could call them to ask about their families or to verify information (Pandu, personal interview, 21 March 2014).

For internal verification of information, the volunteers used the Facebook accounts of Jalin Merapi as channels for internal coordination, discussion, and verification. In practice, a volunteer of K FM explained that the field volunteers or the community radio volunteers created a group chat for each field post on the Facebook groups in advance, so every member

could write and read all information consecutively (Santosa, personal interview, 21 March 2014). Any uncertain information, which was previously provided by the evacuees, would have been shared on the Facebook groups by chatting or wall-posting. The information in question was mostly about the false demands for aid or the rumours of another sequence of Merapi eruptions. In responding to that information, the volunteers or the community radio volunteers, who were located at the nearest field post, would check the information's accuracy directly with an affected community member at the relevant location. This verification mechanism was described by Haji, a volunteer of K FM, as below:

> All community radio volunteers were online [on the Facebook groups] […] they could read the chats […] They would have verified inaccurate information […] We personally trusted our volunteers […] I do not reckon the media, but I 100% trust all information from them [volunteers] […] If someone informed about a condition of a particular area in Mt. Merapi, all we needed to do was chat with the community radio volunteers who lived in that area, and ask them about the information's accuracy. If they said that it was not true, I would have shared it […] We used that mechanism to verify local information. For information of evacuees, we asked the volunteers of Jalin Merapi to directly verify it at the IDP camps (personal interview, 21 March 2014).

Again, similarly to the processes of providing and sharing information, the verification mechanism of the Jalin Merapi network was built on the social networks of community radio volunteers, which established trust and extended the verifier networks. In a conventional disaster response, the authorities often overlook the local social network, as one of the important social aspects of the affected community, particularly regarding information verification.

In addition to the verification process by the volunteers of the community radio stations on the ground, the Jalin Merapi network assigned one volunteer located in the main post to information verification, as described by Nasir above. The volunteer, Widyarsi, verified information by making phone calls to the affected community members providing information and cross-media verification. In her interview, she explained:

> I called them […] They said, "yes, mam. We need that. If you have time, you can come here" […] through direct conversation, I could tell if they were lying (Widyarsi, 27 May 2014).

Although a direct conversation with the information source seems to be old-fashioned compared to the advanced computing technologies, it is an important verification tool to track the details of information down and determine the reliability of the information source (De Rosa, 2014, Law and Bannock, 2014). Asking direct questions will often prompt an individual's confession if s/he has given false information (Wardle, 2014).

In addition to a direct conversation with the person providing the information, Widyarsi also explained the cross-media verification process. She took an exampe of verifying information by cross-checking the information on the Facebook and the Google Docs:

> One time, I had just finished inputting data onto the Google Docs when I read information on the Facebook. It was posted by a person claiming to be a volunteer of Merapi […] It was the same name in different information I just inputted [on the Google Docs] […] I re-checked the name and the contact number […] Confirmed! It was the same person […] He stated that he was a field volunteer in a particular location. He demanded priority of aid distribution […] I called the coordinator of the field post in that particular location. "No, mam. We don't have that name here. Don't respond to him' […] We deleted his name on the list [of the Google Docs] […] When he found it out, he cursed at me through SMS […]He was not located at Mt. Merapi, not one of the evacuees […] He gave his number so he could get the aid for himself […] I monitor all information on Facebook and Google Docs. I cross-checked each of them […] I am an auditor, so I am used to it.

Suppporting the effectiveness of cross-media verification, Meier (2014) agrees that this particular strategy can triagulate information across media to ensure the reliability of information.

Not only to verify the accuracy of the information provided by the affected community, the mechanisms of public and internal verification were also applied to address and clarify any misleading rumours and news that might have led to community panic. According to the interviewees involved in the Jalin Merapi network, Jalin Merapi challenged any misleading rumour or news by verifying the news with the community radio volunteers or the field volunteers in the news associated area. If the news was proven inaccurate, they would share the verification through the media multiplexity of Jalin Merapi. This was clearly explained by Sundary, a volunteer of Jalin Merapi:

> At that time, there were so many message broadcasts shared on BBM [BlackBerry Messenger] stating that Mt. Merapi would erupt again at a particular time […] Jalin Merapi directly checked whether the information

> was accurate or not to the field volunteers and the volunteers of community radio stations. We always reminded [the audiences] not to trust random information sources, [and that] the real condition is blah blah blah […] We did that kind of clarification a lot, even to the national media […]In the end, Jalin Merapi became a place where you could find information clarification (personal interview, 21 April 2014).

Dougall et al. (2008) agree that scanning and clarifying inaccurate news are necessary in disaster communication because of the slow response of the government and the tendency towards exaggerated news in the mass media. Moreover, any misleading news will lead to increased outrage, which leads further to more news coverage, to more outrage, and on and on in an upward spiral (Sandman, 1993). Similarly, all interviewed community members agreed that the national television stations often did not broadcast substantive news but exaggerations, which frightened the affected communities during the 2010 Merapi eruption. Therefore, the finding supports the argument that corrective action over misleading information is important in disaster communication.

7.1.1. Information arrangement of the Jalin Merapi network to maintain validity and accountability

Not simply verifying the information provided by the affcted community, the Jalin Merapi network also applied some protocols to ensure the validity of the information shared through its platforms. In practice, the Jalin Merapi network set some unofficial arrangements in sharing their information with their target audiences during the 2010 eruption. All shared information had to note the time when the information was being shared, the contact number of the person who was responsible for the information being shared, and the location associated with the shared information. By mentioning a specific time, in particular, the Jalin Merapi network attempted to keep its information up-to-date, so its audiences did not share and respond to out-of-date information. This was clearly explained by Zulivan, a volunteer of the Jalin Merapi network, as follows:

> At first, we did not consider that our tweet might have been re-tweeted in a couple of hours, a couple of days […] even a week later […] For example, if we tweeted that Merapi had just erupted, people might have thought that it was still erupting when someone re-tweeted it a week later […] So, we always put [the exact time] the hour and minute in front of our tweet […] in 24 hours format […] It aimed to keep the data accurate and could be quickly responded to […] People could know when the tweet was published […] so

> they would not have responded to expired information (personal interview, 17 March 2014).

The information about a contact person showed who was responsible for the accountability of the information shared. If the information was provided by a volunteer of the Jalin Merapi network, the coordinator of the field post of Jalin Merapi, who was located in the associated area, would have acted as the contact person. Finally, the shared information had to include the detailed location of the information: the district area followed by the sub-district area. If the information was provided by a volunteer located at a field post of Jalin Merapi, the information should have included the name of the particular post. This particular information of the location was significantly useful for information verification as 'geodata is verifiable because its accuracy can be ascertained by walking to the place and checking the data by eye' (Harvard Humanitarian Initiative, 2011, p. 42; Wardle, 2014).

Although the research participants did not consider the references of time-frame, contact person, and location as one of the verification mechanisms of the Jalin Merapi network, that particular information is actually fundamental for the verification process. Numerous experts in the *Verification handbook* (2014) point out the significance of investigating information in reference to the source, the date, and the location in making decisions on the validation of the information in various emergency situations; highly-validated information has a credible source and is published on the event-associated date and in the event-associated location. When the Jalin Merapi network deliberately included the references, they corroborated the validity of the shared information as coming from the affected community in the area surrounding Mt. Merapi during the event of the 2010 Merapi eruption. More importantly, the references were most likely to encourage the perception that the information was verified for the information receivers.

To strengthen understanding that the information it carried was verified, the Jalin Merapi network also emphasised the accountability of their network, particularly to the general public. As outlined in Chapter Five, the Jalin Merapi network coordinated with aid distribution, in addition to their main focus on community-disaster communication. To maintain their accountability, the Jalin Merapi network used a Google Doc to record incoming aid and aid distribution as well as a Google Doc of Demands that acted as the database of information about the needs of the evacuees (detailed in Chapter Six). The report of incoming aid was publicly published on Jalin Merapi's website as "*Data Penyaluran Bantuan via Jalin Merapi*" (Data of aid distribution via Jalin Merapi). It was a matrix

template of compiled information about the details of aid (types and date received) as the "Supplies", the details of the donors (name, address, and phone number), and the details of aid distribution (date, location, and the beneficiary's name). Thus, donors could directly check whether their donations had been well received by the evacuees.

Not only useful for the donors, the report was also used by the field volunteers as a database of aid supplies. As the report had information about incoming and outgoing aid, it automatically had information about the available aid, and what had been distributed at the main post or the field posts of the Jalin Merapi network. Subsequently, the field volunteers could seek available aid that matched any unfulfilled need of the evacuees in their surroundings.

7.2. Publish and then verify before it is too late.

In addition to engaging the participation of the affected community as information verifiers and the internal arrangement to maintain information validity, the Jalin Merapi network also addressed the need for rapid decision making in responding to the needs of the evacuees in the 2010 eruption. According to Nasir, a former Combine staff member who was based at the main-post of the Jalin Merapi network, the process of verifying community-based disaster information in the area around Mt. Merapi had heavily relied on the official hierarchical process of the local government. Ironically, the hierarchical process to ensure the accuracy of information had frequently led to invalidity because of the long time span of the verification process (personal interview, 17 March 2014).

In practice, to be regarded as verified in official disaster response, community-generated disaster information has to be supported by an official. Thus, information from a community member has to be delivered to the low-level of local government in advance, so it can be verified officially by the authorities. Nurwiyono, a head of a sub-district explained the proses of official verification: if information comes from a community member at the hamlet levels, s/he needs to deliver the information to a head of a hamlet or a head of a village in advance. The head of a hamlet or village will verify the information before delivering it further to the head of a district. Then, the head of a sub-district will deliver it to the BPBD regional disaster management agency. Finally, the BPBD will deliver the information to the other government agencies and coordinate with them for further response (focus group, 19 June 2015). This

reflects the Harvard Humanitarian Initiative's finding (2011) which identified that the formal humanitarian community still relies on a hierarchical process for collecting and analysing disaster information.

As a result, by the time information is officially verified and published, the verified information does not represent the real situation; so it becomes invalid. Specifically, Nasir from Jalin Merapi stated:

> The validity of data depends on the situation relatively. Information about building reconstruction may be valid for a week or a month. But, the data of emergency needs is only valid for minutes or even seconds, isn't it? [...] A verification method that can keep up with the change of the real situation is the only choice! [...] If we verified more slowly than the speed of data changes, it was still not valid. For example, the number of refugees in barrack A was 1000 at 12 pm; it could be 5000 or 500 at 5 pm because they might have moved in or moved out. If the number of 1000 was published at 5 pm [...] It was not valid anymore [...] In principle, it had been validated, but it did not represent the real situation [...] This still generally happens up until now. They [the local government] collect the data today and publish it tomorrow morning. It is not real time [...] It is methodologically valid, but it is not valid in reality (personal interview, 17 March 2014).

The inability of the formal verification process to deal with the fast pace of information movement in emergency situations also has been acknowledged in the studies of the Harvard Humanitarian Initiative (2011), and Silverman and Tsubaki (2014). This inability often prevents rapid decision-making in a disaster response. Yet, many organisations, including the local governments, continue to enforce their 'standards and practices for handling crowdsourced information' (Silverman & Tsubaki, 2014, p. 10).

Therefore, according to Nasir, the Jalin Merapi network strongly argued for a mechanism of a real-time verification that can keep pace with the speed of situation changes during an eruption (personal interview, 17 March 2014). In practice, the Jalin Merapi network applied a default principle that all information about the needs of the evacuees was assumed to be accurate until it had been verified as inaccurate; the information was automatically published and compiled on Google Docs before being verified during the 2010 Merapi eruption. In contrast, all information about Mt. Merapi, which could potentially create public panic, was assumed to be inaccurate until it had been verified otherwise. The default principle of information treatment was clearly explained by Wijoyono, a Combine staff member who was also a volunteer at the main post of the Jalin Merapi network, as follows:

> Information about demands for logistics, blood, or medicines was automatically treated as accurate until it was proven otherwise after verification. Importantly, it went online first. We realised that it had weaknesses, but we took the risk to keep up with the speed of change in the situation. So, we didn't filter [the information] by selecting the sources [of the information] purposively. The assumption was everything was important […] On the contrary, for information about a situation that potentially created public panic, we treated it as inaccurate until it was verified […] For example, someone reported that there was a hot-ash cloud [a pyroclastic flow] […] we didn't re-tweet it before we checked it directly with our friends [the community radio volunteers] in the field (personal interview, 17 March 2014).

In addition to keeping up with the fast pace of change, publishing unverified information about the needs of the evacuees was regarded as a form of open data required for public verification. Nasir from Jalin Merapi argued, 'Open data was the condition. It means that the data can be accessed by everyone' (personal interview, 17 March 2014). By publishing the information, the audiences of the Jalin Merapi network, both the affected community and the people outside the affected areas, could participate in verifying the information. If the shared information was verified as accurate, the result of verification complemented the earlier data. Otherwise, the previously shared information was revised and updated on the Twitter accounts and the Google Docs of Jalin Merapi.

Yet, the efforts of the Jalin Merapi network to provide speed was not necessarily flawless. The information shared through the Jalin Merapi network was not necessarily accurate, despite being directly sourced from the affected community. Taking examples of the donations of generators and hay as told by Nasir and Zulivan above, the verification process of the Jalin Merapi network was still vulnerable to fraud when someone attempted to get more aid than s/he actually required. It was particularly so because verification of information was performed when the requested aid had been available and delivered to the beneficiary by the field-post volunteers or the donor. In responding to the flaw, Nasir argued that it was solved by "public punishment" for the fraud. He specifically stated:

> We assumed that the information about the needs [of the evacuees] was accurate until it was verified otherwise […] If they]the ones who provided the information] really needed it, our response was not too late. If the information was inaccurate, it could be revised and there was always a punishment […] to be scolded publicly […] to be blacklisted virally […] I re-tweeted the information about the fraud […] no one contacted them after

> the tweet about the fraud; no one responded when they asked for more aid […] So, it was layered verification (personal interview, 17 March 2014).

Because of the same vulnerabilities, the concept of sharing unverified disaster communication to increase the speed of information was strongly debated by the officials who participated in this study. They argued that they only share verified information in their official disaster communication. One of the officials, Sunyoto, specifically argued:

> At the government level, the information selection is compulsory […] The official information sharing is restricted to the verified information. It has been frequently coordinated, so inaccurate information will not ever be shared (focus group, 19 June 2014).

Although the information may have been verified by Jalin Merapi's audiences, either the affected community or the donors, it is still not likely to be regarded as verified by the officials. In both focus groups, the officials defined verified information as that which has been verified scientifically with a valid methodology by an authorized agency or the experts. This is similar to their perception of risk that also heavily relies on the scientific paradigm in Chapter Four.

The particular official definition of verified information has been regarded as the main determinant of the difficulty of integrating community-based disaster communication, such as Jalin Merapi, with official disaster communication. Going back to the Jalin Merapi network, Nasir from Jalin Merapi explained that the incompatibility of verification between the Jalin Merapi community-based network and the local government was because both parties perceived verified information differently (personal interview, 17 March 2014). His explanation was supported by two other Combine staff members who were volunteers of the Jalin Merapi network:

> That's the challenge. Until now, those who work in disaster management perceive verified information […] as that which is valid methodologically […] or valid according to a certain institution. A NGO or a government agency […] It doesn't matter whether it [the data] represents the reality or not […] They [the NGO and the government agency] are not the only ones who own disaster data (Widarto, personal interview, 17 March 2014).

> The governments don't trust a publicly open verification system […]They prefer a system that is verified by a team in the government itself (Wijoyono, personal interview, 17 March 2014).

In contrast to the local government agencies who strongly relied on scientific and authorized verification, the Jalin Merapi network emphasised that information verification can also be done by the public, particularly the affected community members, who are personally experiencing the information-associated event. Yet, according to Wijoyono, a Combine staff member who was also a volunteer of the Jalin Merapi network, the local government had doubted the data collection system and the public verification of the Jalin Merapi network during the 2010 Merapi eruption (personal interview, 17 March 2014). The doubt on public verification is actually common in disaster communication; there are always criticisms to argue whether the crowdsourcing data is properly collected, or whether samples are unlikely to be representative, or may have self-selection bias (Harvard Humanitarian Initiative, 2011).

I summarize the differences between the verification mechanism of Jalin Merapi and the verification mechanism of the local government in a table below:

Jalin Merapi	Government
Information publication should be performed in real time.	Information publication should be performed after verification.
Valid information means that the information represents the real situation in real time.	Valid information means that the information is methodologically accurate.
Information about the needs of survivors is valid until it is proven inaccurate.	Valid disaster information is the official version from the authorities.
Information verification can be conducted by the local communities as the first responders.	Information verification can be conducted only by an authorized agency.

Table 5. A comparison between the Jalin Merapi network's and the local government's information verification.

7.3. Individual perspective of the community-based verification mechanisms of the Jalin Merapi network.

Notwithstanding the strong misgivings of the officials, the attempt of the Jalin Merapi network to keep up with the rapid changes in a disaster situation made it possible to immediately respond to those who really needed help. The verification mechanisms of the Jalin Merapi network were considered to successfully fast forward the process of information verification by the local government in a disaster response; this was clearly stated by Zakaria, a community member, as follows:

> In the formal procedure of aid distribution, an official has to personally verify to the IDP camps to ensure the evacuees really need the aid. Consequently, the official aid frequently comes late when it is not needed anymore. Jalin Merapi could fast-forward the process in the 2010 eruption […] Jalin Merapi could fill in the gap without interrupting the conventional way performed by the government institutions (personal interview, 27 June 2014).

Moreover, by the audiences of the Jalin Merapi network, the information shared through the Jalin Merapi network was perceived as trustworthy for the speed of its timely updated 'insider' information, its verification by the affected community themselves, its open and accessible data, and its rapid aid distribution. Two interviewed community members described that those particular characteristics had become the determinants of their trust in the Jalin Merapi network. They specifically stated:

> In disaster response and disaster recovery, we need different types of information. Consequently, the way we trust information is strongly influenced by that. In a disaster response, we need rapid information from our social network (Zakaria, personal interview, 27 June 2014).

> At that time, I needed information […] It was very difficult to get the most updated […] I found that Jalin Merapi was the most updated […] even the [news of] TV was not real-time. Well, maybe sometimes it was. But, Jalin Merapi was more real-time […] the most updated [and] intensive […] None was faster than Jalin Merapi at that time […] Those who provided the information to Jalin Merapi, they were really there [in the area surrounding Mt. Merapi] (Ramawanti, personal interview, 24 Jul 2014).

Interestingly, although the community-generated disaster information shared by the Jalin Merapi network was unlikely to be engaged in the formal disaster response at the institutional level, the information was treated differently by the officials at the individual level. According to Wijoyono, a Combine staff member who was also a volunteer of the Jalin Merapi network, the authorities often used the information shared in the Jalin Merapi network for individual purposes, not for institutional purposes (personal interview, 17 March 2014). Supporting Wijoyono, Susetya, a Magelang district officer, stated that he personally accessed the information shared in the Jalin Merapi network because it could provide information that was unavailable on the government agencies' websites, especially the data about evacuees. However, he argued that the information shared through the Jalin Merapi network was partial and not comprehensive enough for the government's interest. Specifically, he stated:

> From my experiences during the 2010 eruption, I accessed Jalin Merapi frequently […] Its features were far more communicative [and] fitted our needs […] compared to the official website of Magelang district […] the magelang.go.id published by the Agency of Communication and Informatics […] I wish its features could be more accessible to those who need it. For example, Jalin Merapi was far more communicative. Honestly! Jalin Merapi had information we could hear directly [the audio-streaming] […] the data of the needs [of the evacuees]. Although, it was still partial, still not comprehensive. But, at least, it [the Jalin Merapi network] was a progressive initiative from the community. It showed creativity in content management, which somehow has to be produced by the Agency of Communication and Informatics as well (focus group, 19 July 2014).

This shows that the community-based verification mechanisms applied by the Jalin Merapi network were more appropriate for individuals and an informal community movement than formal organisations, as described by a volunteer of Jalin Merapi below:

> A community-based information network should not be performed by a big organization, since it will make its movement become slower. It may lose its community-based orientation, because it will focus more on accountability. In order to maintain its accountability, it may create a particular bureaucracy that involves a lot of forms. Meanwhile, what makes Jalin Merapi different is its speed, for not being bureaucratic, and its basis of trust (Widyarsi, personal interview, 27 May 2014).

Unlike the local government members who define information validity based on their institutional logic and scientific approach to maintain their public responsibilities, individuals rely more on trustworthiness, speed, and the compatibility of the information with individual needs. In other words, although people may not verify the information themselves, they tend to automatically consider that information is trustworthy when they know that the information has been verified by someone they trust.

7.4. Conclusion

Integrating the argument in this chapter that the affected community can play important roles in information verifying on the ground with the argument in the previous chapter that the other important role of the affected community is providing and sharing local-relevant disaster communication through media multiplexity, I summarise the three processes of community participation in the information flows of the Jalin Merapi network as below.

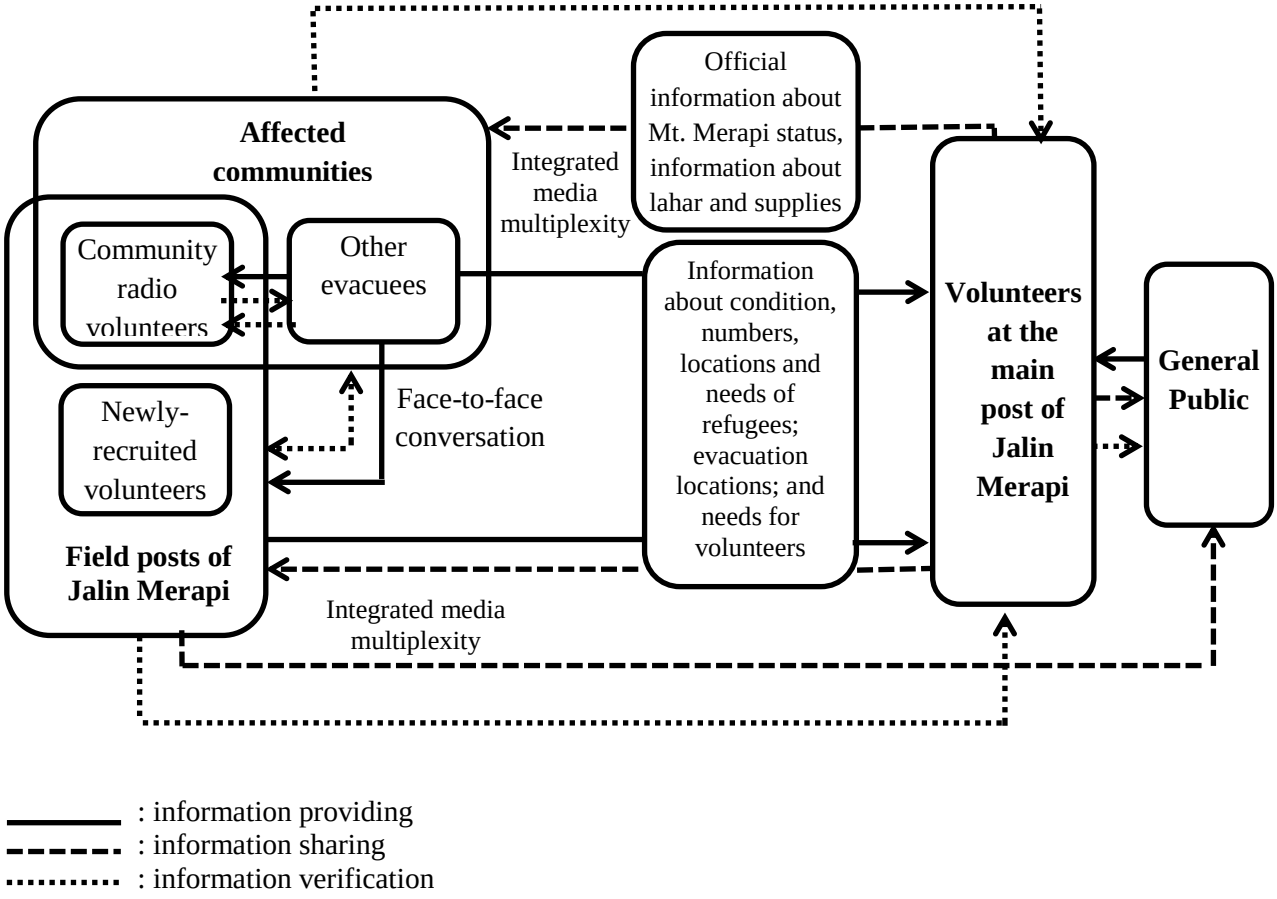

Figure 26. Information providing, sharing, and verification in the Jalin Merapi network during the 2010 Merapi eruption.

To maintain the validity of the information shared in its platform of media multiplexity, the Jalin Merapi network closely engaged the participation of the affected community, including the volunteers of the community radio stations. This chapter also addresses the third research question by focusing on community participation in verifying information provided by other affected community members. The affected community members had access to the real situation on the ground. So, they were able to quickly verify whether the information was accurate. Additionally, as part of the Jalin Merapi network, the volunteers of the community

radio stations played an important role in extending the verifiers' network on the ground with their personal social networks. So, the verifiers' network encompassed all areas surrounding Mt. Merapi. In practice, the volunteers of Jalin Merapi used Facebook groups, direct phone-calls to the people who provided information, and cross-media strategies to verify the information provided by the affected community. As well as focusing on verifying information from the affected community, Jalin Merapi also maintained the validity of its information by including references to the time when the information was being shared, the contact number of the person who was responsible for the information being shared, and the location associated with the shared information. Also, the Jalin Merapi network published a regularly-updated report of incoming aid and aid distribution to maintain its accountability. The verification mechanism of the Jalin Merapi network attempted to address the inability of the official verification mechanisms to keep up with the fast pace of changes on the ground during the 2010 eruption. In practice, Jalin Merapi applied a default principle that information about the needs of the evacuees was published and verified afterwards. Meanwhile, information about Mt. Merapi's hazards had to be verified before being published.

However, the community-based verification mechanisms of Jalin Merapi are unlikely to be adopted by the organisations with formal procedures for disaster response, such as the local governments, because they do not fit the institutional logic of accountability that demands a more explicit methodology. This is particularly because of the discrepancy in the definition of verified information between the local governments and the Jalin Merapi community-based network. The local governments have defined verified information as that which has been verified scientifically with a valid methodology by an authorized agency or the experts. On the other hand, the affected community also has an idea about what information validity means, which apparently is different from the definition adopted by the government. The community-based verification mechanism is more likely to fit the community's idea of information validity than the institutional logic of information validity. At the individual level, the mechanism of community-based verification is regarded as faster than the official verification mechanism and able to immediately respond to those who really need help. In particular, the community-based verification mechanism is faster in providing locally-relevant information, is more compatible with individual needs during a disaster response, and emphasises data openness. In the case of the Jalin Merapi network, those particular characteristics have led to trust in disaster communication.

This thesis does not necessarily suggest adopting community-based verification mechanisms for official disaster communication processes. Unlike Jalin Merapi's community-based informal movement, the local governments have to face penalties both from the law and the public if they share faulty information. Moreover, the local government is responsible for all lives in their territories; thus, one simple mistake may impact a lot of lives, with potentially fatal consequences. However, I argue that engaging the affected community as active information verifiers is worth combining with official disaster communication, especially because of the ability to encourage trust in disaster communication as shown in this case study of the Jalin Merapi network.

Chapter Eight

Conclusion

By specifically investigating the case study of Jalin Merapi during the 2010 Merapi eruption, this thesis provides an in-depth understanding of trustworthy and participatory community-based disaster communication in responding to a disaster. The thesis used the methods of in-depth interviews and focus group interviews in gathering data and the constructivist grounded theory in analysing data. The data analysis constructed a framework for understanding trustworthy and participatory community-based disaster communication. Therefore, this final chapter summarises the research arguments by referring to the research questions about the community perspective on trustworthy and community-engaging official disaster communication, whether community capital encourages trustworthiness and collective participation, and the processes of community participation in a networked disaster communication. The chapter will discuss the contributions of this thesis to theoretical and practical knowledge, reflect on some limitations of the research and offer suggestions for future research.

8.1. What do the members of the affected community regard as trustworthy and community-engaging official disaster communication in responding to the Mt. Merapi eruption?

On the part of the affected community, this research identified that official behaviour by local authorities in the Merapi region of Indonesia has a strong influence on the trustworthiness of their disaster communication. Trust in official disaster communication is not a straightforward result of formal message design and using the most up to date media. Specifically, the interviewed local communities living on the Mt. Merapi slopes mistrust the official disaster communication for three main reasons.

Firstly, the interviewed community members distrusted the officials because they perceived that officials were secretive about disaster information. This perception was perpetuated by the community's experiences of having received delayed, critically-close-to-emergency information, or no official information at all, during disaster responses since the 1994 Merapi eruption. *Secondly,* the interviewed community members perceived that officials were not fully committed to the local communities' safety during a disaster response, as the

government agencies tended to share only information that was useful for the authorities rather than for the affected community. This understanding is based on the differences between the community's cultural needs, and the local governments' focus on hazard-related scientific logic and economic-political national interests, in appraising the risk of the volcanic hazards of Mt. Merapi. *Thirdly*, interviewed community members mistrusted the officials because of the lack of interactivity in official disaster communication, which indicated that local governments do not value community feedback. The local governments have adopted the unidirectional, top-down and bureaucratic communication model in both their conventional "offline" and online disaster communication.

The findings demonstrate that many of the affected community around Mt Merapi regards official disaster communication as trustworthy and community-engaging when the local governments provide (1) prompt and accessible information reflecting complete official disaster information, (2) recognition of the community's local knowledge and concerns, and (3) community engagement through interactivity. When the affected community regards the local government as being unable to provide those, it can lose confidence in the government's actions and so lose trust in the accuracy or usefulness of information provided by the government, regardless of the local community's urgent need for information in responding to a disaster.

On the part of the local government, the informational delay and inaccessibility, which have made the local governments appear secretive, results from two main conditions: the information silos within the cluster design and sectoral bureaucracy adopted by the local governments, and the absence of a direct mechanism for the officials to communicate with the affected community in a timely manner. Specifically, each government agency manages information based on its main functions, which further forms information silos in the official disaster communication. Consequently, when a community member does not know which information silo belongs to which agencies, they will not know where to look for the appropriate information during a disaster response. Similarly on the part of the authorities, the information silos prevent a timely response to the critical need for information from communities. Moreover, the authorities tend to generalize their message design and the audience of their disaster information. The generalizations are often inappropriate for responding to the individual demands for specific types of official and locally-based information from the authorities. As a result, again, the official disaster communication may

become inaccessible and slow in sharing information to the community living on the slopes of Mt. Merapi, which most likely further reduces perceptions of trust.

Similarly to the local community's mistrust in official information, many of those responsible for information in local governments have regarded community-based disaster communication in this research as untrustworthy, unreliable and unverified; although the local governments have acknowledged the community's capacity for voluntary collective actions and providing local disaster information. In particular, the local governments have regarded the local communities living on the Mt. Merapi slopes as risk averse and likely to panic, and too easily led by their cultural understanding of Mt. Merapi rather than science. As a result, the local governments have consciously only engaged the affected community to a limited extent in their official disaster communication, and this lack of community engagement has in turn reduced community trust in the official disaster communication.

The perspectives of both the affected community and the local governments bring us further to the conclusion that reciprocal trust is influenced heavily by the behaviours of disaster communication of each party. In official disaster communication, the governments' behaviours in providing promptness, accessibility, interactivity, community engagement, and perceiving risk affect the degree of trust of the affected community. Subsequently, the level of the community's trust in the official disaster communication affects the community's behaviours in their community-based disaster communication. When the community distrusts the local governments, they are unlikely to cooperate with the local government and maintain their confidence in it during a disaster response; additionally, this lack of confidence can lead to an excessive risk perception. On the part of the local governments, the community's reluctance to cooperate and excessive risk perception have been considered to prevent the community responding to a disaster effectively, which leads further to a lack of trust in the community-based disaster communication. Furthermore, when the authorities do not trust the affected community as an equally capable partner, they are unlikely to engage with it. Again, from the perspective of the affected community, a lack of community engagement can increase the level of distrust in the official disaster communication.

Therefore, in order to encourage trust in official disaster communication, this thesis provides three fundamental suggestions. *Firstly*, it is important to develop more transparent and immediate official information sharing by using accessible communication technology, in order to facilitate the community's real-time access to official disaster information. *Secondly*,

the local governments need to give the local communities more recognition for their own ways of knowing and understanding Mt. Merapi. This can be done by combining the scientific risk assessment applied by the authorities with the socio-cultural knowledge of the local community that influences individual interpretation of disaster information. *Thirdly,* it is important to engage the affected community as information couriers in official disaster communication. This research shows that engaging the affected community with more prompt information can encourage trust and, furthermore, community willingness to corporate with government agencies in official disaster communication.

8.2. How can community-based disaster communication be regarded as trustworthy and facilitate community participation in a disaster response?

When referring to the reciprocal trust between the affected community and the local government, identifying the trustworthy aspects of community communication may be useful to decrease the government's doubt in community-based disaster communication, and, subsequently, increase the affected community's degree of trust in the local governments. This thesis describes the social capital engaged by the Jalin Merapi network that successfully encouraged trust in the community-generated information shared by the network in the 2010 Merapi eruption. Particularly, the engaged social capital takes the forms of culturally-embedded disaster communication and the tie strength of the local social network, built by the volunteers of the community radio stations who are already embedded in the local communities and trusted by the locals.

8.2.1. How can culturally-embedded communication encourage trust and collective participation in community-based disaster communication?

Through the case of the Jalin Merapi network, this thesis argues that culturally-embedded disaster communication performed by the affected community effectively increases the level of understanding and trustworthiness of the community-generated disaster information. Particularly, the culturally-embedded disaster communication in this research uses local language and engages psychologically familiar cultural knowledge in disaster communication. When the disaster information is delivered in the local language used by the affected community, it increases the level of understanding, reduces misunderstandings, and encourages community trust because of the familiarity it has created. Disaster information in the local language is also regarded as trustworthy by the people outside the affected areas for

its authenticity as locally-based information coming from the affected community. In addition to using local language, adopting the local cultural geomyths in disaster communication makes disaster information more understandable than a scientific explanation, for all levels of the local community, because it can contextualise the knowledge with their daily life.

The particular argument that cultural engagement encourages trust supports previous research that argues that cultural values have a positive association with trust (Guion et al., 2007, Romo‐Murphy et al., 2011, Veszteg et al., 2015, Uslaner, 1999, Widén-Wulff et al., 2008). The argument also counterbalances previous research that identifies the negative effects of the local cultural beliefs on the risk perception of the local communities living on the Mt. Merapi slopes (Butt, 2014, Donovan, 2010, Donovan et al., 2012, Dove, 2008, Lavigne et al., 2008, Schlehe, 1996).

8.2.2. How can the tie strength of local networks encourage trust and collective participation in community-based disaster communication?

Through the case of the Jalin Merapi network this thesis argues that strongly-tied individuals (the volunteers of community radio stations, in this case) played important roles in distributing information among the members of the affected community and encouraging trust in disaster communication. In particular, strongly-tied individuals who share common community membership and have personal relationships with disaster victims, have the knowledge of the local language and culture required to access useful information about fragile disaster victims, so a disaster response can be designed appropriately for their specific needs. Without this kind of information, outside humanitarian aid workers often have to struggle for access to fragile disaster victims. As well as gathering local information from the affected community, the strongly-tied individuals are useful for sharing information into the affected community because of their personal social network and their knowledge of who talks to whom, about what, via which media, as well as local media accessibility in the affected community, and the reliable local information nodes who play important roles in information sharing on a regular basis. The argument that strong ties effectively facilitate information sharing within the affected community mirrors the research of Opsahl et al. (2010), Putnam (1993, 2000), and Uslaner (1999) that supports the effectiveness of strongly-tied social networks in facilitating internal information diffusion.

Moreover, when community members receive information from their friends or people with whom they have close relationships, the information is most likely to be considered to be trustworthy and reliable by the community members. Engaging strongly-tied individuals can clarify which information sources are perceived as guaranteeing information validity and, further, encouraging trustworthiness. The argument that strongly-tied social networks encourage trust supports the previous research (Bouchillon, 2014, Opsahl et al., 2010, Putnam, 1993, Sias and Wyers, 2001, Uslaner, 1999, Murayama et al., 2013, Fisher, 2013, Harvard Humanitarian Initiative, 2011, Haythornthwaite, 2005, Putnam, 2000) about the close relationship between trust and a strongly-tied social network.

Slightly differently from the strong-ties, the weakly-tied individuals played important roles in external information sharing from the affected community to those outside the affected areas, and vice-versa, and indirect trust encouragement in disaster communication. The weakly-tied individuals in the Jalin Merapi network enabled the affected community to share information with the outsiders and gain new information from them. The argument mirrors the previous studies (Fisher, 2013, Lin, 2001, Widén-Wulff et al., 2008, Granovetter, 1973, Valente and Fujimoto, 2010, Hansen, 1999, Borgatti and Halgin, 2011, Johnson, 2007) about the abilities of weak ties to bridge information between different social networks and to provide access to new information from those beyond an individual's close-community network.

Moreover, engaging weakly-tied individuals has an indirect effect on trust encouragement compared to the direct effect of the strongly-tied individuals. Specifically, the weakly-tied individuals extended the trust initiated by the strong ties of the Merapi people with personal recommendations on Jalin Merapi's trustworthiness within the extended networks. This argument mirrors the study by Granovetter (1973), Fisher (2013), and Haythornthwaite (2005) regarding the positive association between trust and weak ties. However, together with Bouchillon (2014) and Widén-Wulff et al. (2008), this research shows that the trust encouraged by weak ties is thin and unsustained. The interactions and trust among the weakly-tied individuals can easily vanish because of their dependency on temporarily shared interest, the medium used to connect with other group members, and the key actors. In the Jalin Merapi network, the weakly-tied individuals' interactions were encouraged by their shared interest in the temporary event of the 2010 eruption and facilitated by social media. When the facilitating social media or the hazardous eruption of Mt. Merapi is no longer available, the weakly-tied individuals will lose their interest in maintaining continuous interaction; this argument is similar to the studies regarding the collapse of a sense of

community in a social network that consists of weak ties in online community (Haythornthwaite, 2005, Miller, 2011). Moreover, the indirect trust embodied in weak ties is unlikely to survive a key actor turnover, which in this case would be the volunteers of the community radio stations.

8.3. How does the affected community participate in community-based disaster communication through media multiplexity?

The trust encouraged by the culturally-embedded communication and the tie strength of local social networks leads further to individual willingness to participate and collaborate with others in a collective action of community-based disaster communication. To the general public, the Jalin Merapi network was well–known for collective participation by the affected community in providing, sharing, and verifying very specific local information, which made it became trustworthy community-based disaster communication accordingly. In order to be able to do so, I identified that the Jalin Merapi network engaged an integrated media multiplexity rooted in the local communication behaviours and existing local social networks of the affected community members. By combining those two, the affected community could participate in disaster communication conveniently in trustworthy familiar friend-to-friend networks.

8.3.1. Media multiplexity in participatory disaster communication

To enable the affected community to participate conveniently, I argue that the multiple media used in disaster communication needs to be based on the existing local communication behaviours, integrated in a platform, and flexible. During the 2010 Merapi eruption, the Jalin Merapi network used multiple media that were selected based on the specific patterns of media usage tied into the existing information flows and the way local people communicated with each other in local disaster communication about Mt. Merapi. Specifically, people may use different media from another, in accordance with the Uses and Gratification Theory (Rubin, 1994) and Channel Complementarity Theory regarding individual media selection. Thus, a particular medium may have different levels of exposure and accessibility between different individuals. Closely engaging the individuals' patterns of media usage may promote community participation in disaster communication because they can easily seek or share information conveniently through the media that they feel most comfortable with and can use

most easily. This research shows that familiarity with the media used in disaster communication plays a significant role in promoting community participation.

In addition to building on existing local communication behaviours, this research shows the importance of compiling the simultaneously engaged media into an accessible platform. This can simplify the processes of seeking information in multiple media and transferring information from one medium to another when an individual often uses multiple media in seeking and sharing disaster communication (BBC, 2012, Palen, 2008, Reagan, 1996). The compilation is also useful for connecting different individuals, even different community groups, with different media preferences in their disaster communication. Moreover, I argue that the compilation of the multiple media is useful for overcoming the limitations of each engaged medium by utilising the strength of the other media. Comparing offline with online media, the affected community around Mt. Merapi is more familiar with offline means of communication, such as two-way radio and face-to-face communication, which facilitates communication, but is less available to the general public. Hence, combining the familiar traditional channels of communication with the internet-based communication technologies provide exposure to broader audiences and familiarity in disaster communication.

Moreover, I argue that flexible media multiplexity can be effective for adapting to the uncertainties of a disaster, which may lead further to changes of media usage and information demands of the affected community. In this research, flexibility is exemplified by the change in the number of media engaged in the media multiplexity, as the number can be increased or decreased based on the changes in the information demands of the target audience. Supporting Shannon et al. (2014), flexibility in disaster communication, in general, is more likely to be provided by an informal community-based network consisting of fluid friendships than the official bureaucratic and bottom-up structure.

8.3.2. Community participation in community-based disaster communication

In this research, community participation is classified into three main forms: providing information, sharing information, and verifying information (Palen et al., 2010, Palen, 2008). *Firstly*, the affected community members are the first responders who have experienced the disaster themselves. Thus, they can provide specific disaster information about the condition of the affected areas, the possibility of upcoming hazards, the condition, numbers, demography, locations and specific needs of the survivors, aid distribution, and the requirement for volunteers based on personal experiences and visual and audio observation of

the surroundings. Additionally, they can provide warnings about potential local hazardous threats based on their knowledge of what happens daily in their own environment where the disaster occurred, and their cultural beliefs. Facilitating community participation in providing local information, those with better access to communication technologies can play an important role as trusted information couriers in mediating between those with limited access to communication technologies and the outsiders. The role of information couriers is more effective if it is played by affected community members themselves rather than humanitarian volunteers who are outside the local social networks. I argue that the fragile affected community finds it more culturally and linguistically convenient to entrust their personal disaster information to familiar faces. This argument is also analogous to the findings of Mohr (1992) and Perez-Lugo (2004) who emphasized the significance of social networks in connecting isolated individuals to the outsiders in a natural disaster response.

Secondly, this research argues the importance of distinguishing information shared based on the specific demands of the affected community and the demands of the general public (as the worried well). During the 2010 Merapi eruption, the Jalin Merapi network divided its target audiences into the general public (those outside the affected community) and the affected community. Based on the distinctive priorities of information demands between those two, the Jalin Merapi network shared information about the needs of the evacuees to the general public, and information about Mt. Merapi's status from the BPPTKG, lahars from the two-way radio users, and aid supplies from donors to the affected community.

In practice, Jalin Merapi applied a cross-posting strategy to share information through multiple media. By posting the same vital information from one medium in(on)to other media, the cross-posting strategy increases message prominence and message exposure to the target audiences who are using different media at the same time. This finding is similar to the studies of Austin et al. (2012), Dougall et al. (2008), and Jaeger et al. (2007) that suggest the redundancy of transmitting the same key messages across multiple platforms is effective for encouraging audiences to be more responsive to disaster information. In posting community-generated information across different media, I argue that compiling the detailed information in a continuously-updated and accessible database can be extremely useful for setting information priorities and simplifying the process of information seeking of the target audiences. Further, the updated and compiled information can speed up the response because it eliminates the need to spend time gathering scattered information.

In addition to the cross-posting strategy, the Jalin Merapi network engaged the volunteers of the community radio stations as couriers for information sharing to the affected community. As parts of the affected community themselves, these information couriers could use their personal social network for sharing information with their disaster-affected friends and families, as well as their knowledge of local information nodes who could act as the initial points for forwarding information to other community members. In this research, the local information couriers were effective for overcoming the absence of direct mechanisms of delivering official disaster communication to the affected community and connecting the available supplies of aid from outsiders to the specific demands of the affected community, even the smallest or the uncommon ones.

Thirdly, in addition to identifying the roles of the affected community in providing and sharing disaster information, this research also argues the important role of the affected community in verifying information on the ground. The case of the Jalin Merapi network showed that the affected community voluntarily participated in verifiying the accuracy of the information associated with their surroundings. Not just directly investigating the situation on ground, community members used their trusted personal networks to ask people living in less accessible areas for information. In other words, they extended the verifier networks by using their personal networks to fill in the 'blank spots' of information verifiers; so, the process of information verification could encompass all of the affected area.

In verifying information, the Jalin Merapi network did not just depend on the affected community, it also applied internal verification mechanisms by using its Facebook groups, direct phone-calls to the people providing information, and a cross-media strategy. Moreover, in order to maintain the validity and accountability of information, Jalin Merapi included the references to the time when the information was being shared to ensure the novelty of the information, the contact number of the person who was responsible for the information being shared, and the location associated with the shared information. Likewise, the Jalin Merapi network published a continuously-updated and accessible report about supplies of aid (e.g. types of available aid, donors) and aid distribution (e.g. date of distribution, location(s) of distribution, beneficiary). Including references to time, information source, and location, and publishing the aid report demonstrates accountability and, further, increases the trustworthiness of a community-based network such as Jalin Merapi.

As well as verifying information accuracy, this research also emphasises the need for real-time verification that can keep pace with the speed the situation changes during a disaster response. The difficulty in keeping up with the fast pace of changes has become a limitation of the bureaucratic process of official information verification. In this research, the Jalin Merapi network managed this by publishing information about the needs of the survivors before the information was verified, revising it later if it was verified as inaccurate. In contrast, the information about Mt. Merapi's hazards had to be verified before being published. As a result, this research shows, the particular mechanism indeed can be faster than the official verification mechanism and respond to those who really needed help immediately. Yet, the mechanism is still vulnerable to fraud. Thus, it is unlikely to be adopted by the local governments in their official disaster communication because it does not fit with the institutional logic of accountability.

The publication of unverified information about the needs of the survivors was not the only controversy between the Jalin Merapi network and the local governments. This research identified that publicly-verified information is not necessarily accepted as verified by the local governments. The main argument for not accepting it is that the local governments' definition of valid information is verification by a valid scientific methodology, experts, or the authorities. Although a piece of information has been verified by a community member, the information is unlikely to be accepted as valid information by the local governments if it is not authorised by an official or scientifically verified by the experts. On the other hand, the public verification fits the community's definition of valid and trustworthy information. Consequently, although it is controversial at the government level, this research presents the value of combining the mechanisms of community-based information sharing and verification engaging the affected community, such the ones used by the Jalin Merapi network, into the official disaster communication. This is because of their abilities to share local-related information, which is needed by the affected community and has been absent in the official disaster communication, and to encourage trust at the individual level.

Similarly to many studies using grounded theory (Charmaz, 2006, Corbin and Strauss, 2008, Glaser, 1978, Hansen, 2009, Miller and Salkind, 2002), the conceptual relationships between the findings of this thesis are presented in the systematic diagram/ model below. The argument behind the modelling/diagramming is to provide a visual representation of the abstract and complex connections among the social capital of an affected community, trust, community participation, and media usage in community-based disaster communication.

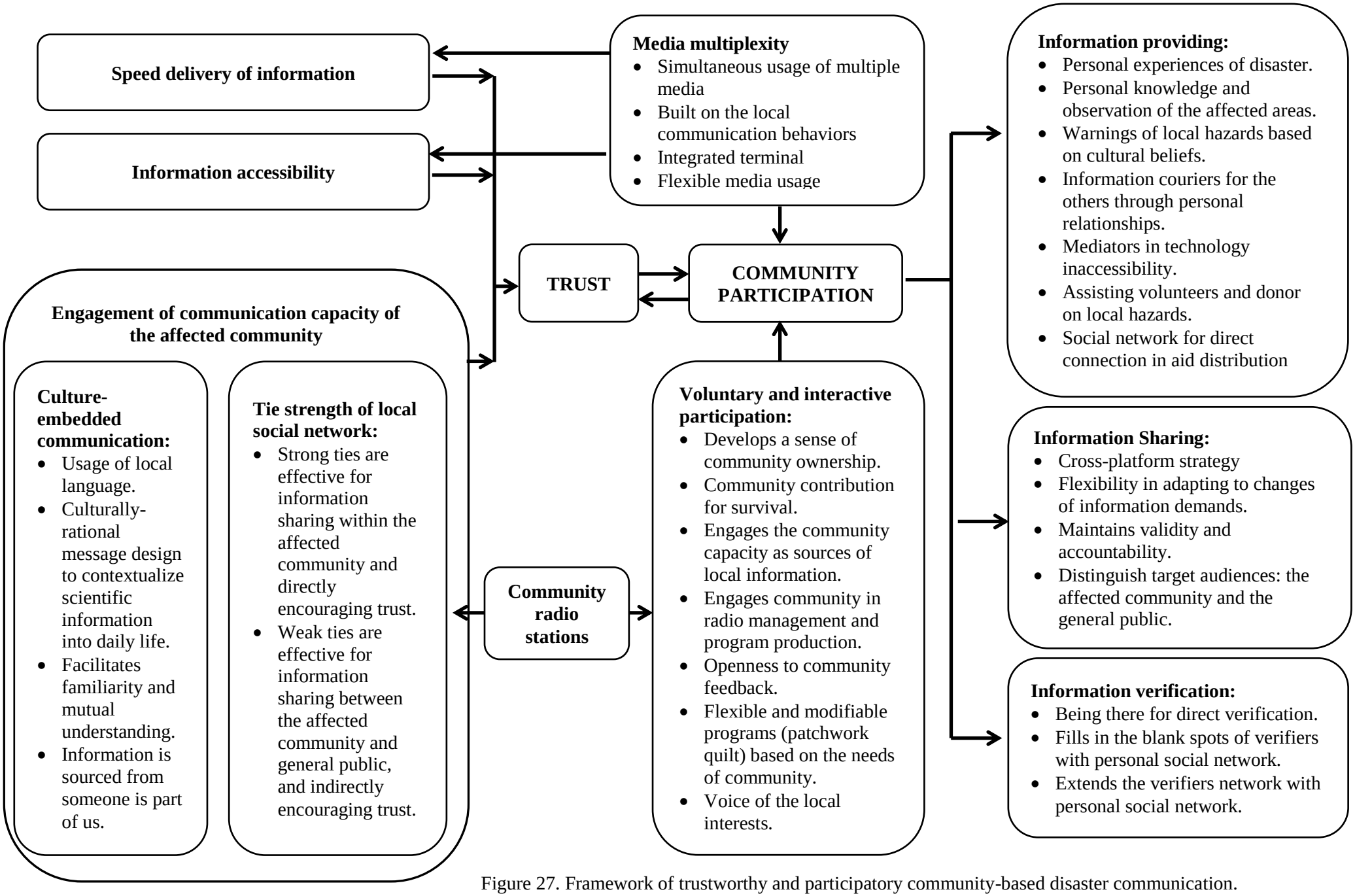

Figure 27. Framework of trustworthy and participatory community-based disaster communication.

8.4. Thesis contributions to theory building and practical knowledge

Adopting the methodology of grounded theory, this thesis aims to develop concepts of trustworthy and participatory community-based disaster communication that can be applied more widely and beyond the literature. Aligning with previous research such as those of Bankoff et al. (2015) and Troll et al. (2015), this thesis emphasises that disaster communication needs to start moving from the supply-driven approach based on the priorities of outsiders to the demand-driven approach based on the priorities of the affected community in order to ensure trustworthiness and effectiveness. Particularly, this thesis frames the demand-driven approach by directly involving the local actors, the affected community, to gain more accurate understanding of the insider perspective. Moreover, engaging the local actors, and simultaneously engaging their social capital, enables the affected community to perform their own community-based disaster communication in a way that is suitable to their local context. In practice, this thesis answers the global calls of the United Nations in the Sendai Framework (2015) and the International Federation of the Red Cross and Red Crescent Societies in its World Disaster Report (2015) for a people-centered approach by engaging the participation of local actors to establish efficient and accountable humanitarian responses.

This thesis is also significant in responding to the lack of attention by existing research to how disaster communication is considered trustworthy by the affected community, and how it can increase collective participation. The failure of most research into disaster communication to recognize the way an affected community regards trustworthiness based on their perspectives of a hazard has also been raised by some scholars such Ferrante (2010), Reinhardt (2015), and Steelman et al. (2015). Responding to the lack of attention paid to the affected community, this thesis contributes a detailed perspective on an affected community into the existing research on disaster communication. Moreover, this thesis provides the community perspective from a developing country, which has been less explored and less well-documented in existing research about disaster communication.

For the affected community, one of the qualities of disaster communication that is considered able to encourage trust is that it engages the community's communication capacity. Yet, engaging community members in disaster communication often ends up with the debate about whether the information provided by the community members is trustworthy or not. Together with Johnson (2007) and Steelman et al. (2015), this thesis takes a position on the

debate by arguing that community-based disaster communication can be regarded as trustworthy by an affected community when it engages the local socio-cultural knowledge and the tie strength of the local social networks. Expanding on the others' research, the thesis can contribute details about the socio-cultural aspects of an affected community that can encourage trust at the individual level and facilitate collective participation in disaster communication at the community level, namely culturally-embedded communication. More specifically, the argument that culturally-embedded communication encourages trust can contribute to the significance of engaging culture into the existing research on crisis communication; as Fronz (2012) and Hewitt (1983) have acknowledged that the existing theories of crisis communication have treated socio-cultural factors as less significant than other communication factors. Moreover, this thesis has shown that the existing strongly-tied social network and trust (and distrust) among disaster-affected community members, and their local cultural knowledge are not disrupted in the same way as the mass-mediated and institutionalised structures can be affected by an extreme disaster such the 2010 Merapi eruption. Instead, they are strengthened by being used intensively during a disaster response.

As well as contributing to theoretical knowledge, this thesis also has the same practical implications for designing trustworthy disaster communication. The understanding of how an affected community perceives trustworthiness in this thesis can be useful for emergency managers designing their disaster communication to fit community perceptions and ensure the community's trust accordingly. Moreover, the argument that culturally-embedded communication encourages trust can be useful for bridging the historically existing gap between the community-based informal approach and an organisational formal approach in disaster communication. Integrating socio-cultural knowledge in official assessment can overcome the incompatibility between some cultural beliefs adopted by an affected community and the scientific approach adopted by the experts and the authorities. This integration also can be another way to translate the scientifically technical disaster-related information of the experts into language that can be easily understood by the lay public such as the affected community. When experts (including the authorities) and the affected community reach the same level of understanding, dialogues and fruitful interactions between both parties are most likely to happen. In other words, this thesis can be a valuable empirical example for emergency managers to understand the appropriate efforts of disaster communication in disaster-prone areas that are very much affected by the local culture, such as the 2010 Merapi eruption in Indonesia.

Additionally, understanding how a specific social tie influences disaster communication is useful for designing a conducive and trustworthy "environment" for disaster communication to facilitate collective participation and effective information sharing within a specific target audience, such as the affected community or the general public. This benefits emergency managers in designing their disaster communication, and also benefits the affected community members. Individuals can have the ability to choose a specific local social network or a combination of strong and weak ties, which can provide the trustworthy information they require, and avoid information overload and exposure to irrelevant information. The ability increases the capacity of the affected community for effective disaster communication and, further, an effective disaster response.

Not only useful for designing trustworthy disaster communication, this thesis also has the same practical implication in designing participatory disaster communication. Specifically, the understanding of media multiplexity in this thesis can contribute knowledge to emergency managers regarding selecting and using media that can make the process of participation more convenient for the affected community. The argument that media usage needs to be based on the existing local communication behaviours of the affected community is particularly important in responding to the recent tendency to suddenly introduce a new platform of communication technology as a novel solution in communicating with the affected community every time a disaster occurs. Imposing a new platform of communication technology by overlooking the local pattern of disaster communication can harm the accessibility of disaster information. It changes how the information can be accessed, and by whom (Haythornthwaite, 2005). It also means forcing the communities to instantly change their formerly-established communication behaviours, which is extremely difficult to do during an emergency situation. The argument to avoid being too focused on the latest tech solutions also conveys the importance of community relations within the media themselves. Having a solid relationship with the community may provide knowledge about types of information needed by the community and trustworthy local information sources. The knowledge, further, can assist the media to design and deliver their messages in an appropriate way for the community.

This thesis also contributes a reminder of the roles of the traditional means of communication, which still exist and are still used by the local communities, to the research and the practice of disaster communication. This reminder is necessary for responding to the increasingly-popular focus of existing research on disaster communication (e.g. Crowe, 2011;

Palen and Liu, 2007; and Sutton et al., 2008) and humanitarian activities using the internet-based media as the most novel and in-trend communication technologies, so that the old-fashioned means of communication are often left behind in disaster communication. Some traditional means of communication, indeed, may be inferior to the internet-based media in relation to the ability to rapidly share disaster information from one point to multi-points. However, this research shows that the old-fashioned means of communication embody the familiar and existing communication capacity of the community. As familiarity leads to effectiveness and trustworthiness, combining the traditional means of communication and the novel internet-based media can contribute effectiveness and trustworthiness into disaster communication dedicated to the affected community and also to the general public.

Particularly for Indonesia, this thesis highlights the importance of setting up disaster community-based information network in disaster-vulnerable areas and integrating community-based information system with the official disaster information system. These ideas can be applied by involving multiple parties in disaster communication such as the disaster-affected community members, local community media, and the local authorities. Yet, it is important to acknowledge that involving multiple parties may risk having multiple overlapping information sources. Responding to that risk, the local authorities can play an important role as an "umbrella" networking the involved parties as the Jalin Merapi network did in networking the community radio stations surrounding Mt. Merapi, in order to ensure the reliability of information. Moreover, the formal structure of Indonesian disaster management has made it possible to design a disaster response based on specific local needs. Yet, with 300 ethnic groups and more than 700 languages and dialects, Indonesia needs to design its disaster communication in a more culturally-humanistic and less institutionalised manner in order to fit the specific local culture of the disaster-affected community. Furthermore, rather than only relying on established expertise, the local authorities need to acknowledge the importance of community relations in their daily practices by building "friendships' between the authorities and community on a day-to-day basis. "Friendship" can encourage trust between those parties, which can be significantly useful in maintaining trust in disaster communication.

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Appendix A: Interview guidelines, information sheet, and interview schedule for the semi-structure in-depth interviews.

SEMI-STRUCTURED INTERVIEW QUESTIONS
For Combine Resource Institution (CRI)

1. What were CRI's roles in the development of Jalin Merapi (JM) Networks? Nowadays?
2. What are the aims of the development of JM?
3. What were the challenges in JM's development?
4. Who have involved in JM? In what role?
5. Why were community radio stations and social media selected in the first time? (compared to other media)
6. How was the selection process of the community radio stations to be involved in JM?
7. How did the local communities accept the JM? Why? Especially related to their communication (media preference, infrastructure, literacy rate) and cultural behaviors (language, beliefs, etc)?
8. What are the supporting systems (fund, infrastructure) for JM?
9. What were the efforts to build JM as a trusted information source?
10. Is JM sufficient to fulfill communities' needs of rapid and reliable information? Why?
11. How was JM compared with official information management?
12. Does the local government support the JM?
13. How can JM contribute and be integrated in official disaster management?

SEMI-STRUCTURED INTERVIEW QUESTIONS
For Community Radio Stations

1. What are the characteristics (content, audience, etc) of your radio station?
2. How do you define your radio's responsibility to the community regarding to Merapi eruption?
3. Before the development of JM, how did you disseminate information of previous Merapi eruption?
4. How and why did your radio get involved in the development of JM?
5. Who is responsible on the operational JM in your radio?
6. How were the roles of your radio station as a stimulus or mediator for community participation in JM social media accounts?
7. Who or what were the sources that provided the information for JM?
8. How was the information verified?
9. What kind of information that was mentioned before and after the 2010 Merapi eruption? The aims?
10. How was the information shared to the communities? In what channel?

11. Was a specific JM social media account used for a particular information or particular audience?
12. How was the mechanism to respond the communities' feedback of the information that was mentioned in JM?
13. How was the mechanism to compile all the information from multiple JM social media accounts?
14. Was it also integrated with official source(s) and other sources? If yes, how?
15. Did Javanese culture and beliefs have influences on the whole information sharing process? How?
16. What kinds of interference that could disrupt the process of information sharing? (bureaucracy? Internet connection? Else?) How? What was the solution?

SEMI-STRUCTURED INTERVIEW QUESTIONS
For Volunteers

1. How did you know about JM?
2. Why, when and how you decided to participate in JM as a volunteer?
3. What was your participation in JM?
4. What kind of skills and facilities that you needed to participate in JM?
5. What was the challenge to participate in JM? In what order? How did you cope with?
6. Did your culture (Javanese) and beliefs have influence on your participation?
7. Before the development of JM, did you participate in previous Merapi eruption? If yes, why and how?
8. How did you get reliable information of Merapi eruption before the development of JM?
9. How did you use information from JM before and after the 2010 Merapi eruption?
10. As a volunteer and a part of local communities, what kind of information did you need most? Why?
11. What kind of information did you provide and share in JM?
12. Did JM become effective means to fulfill your information need? Why? (Regarding to media preference, accessibility, literacy, etc.).
13. Did you trust JM? Why?
14. How did you verify the information from JM as it motivated you to help the refugee or give donation? (this question will be addressed to someone who is outside the local communities)
15. How do you compare JM, other media (television, newspaper, etc.), and official source(s) regarding to their trustworthiness and effectiveness? Why?
16. Who was in charge to coordinate the volunteers in JM? How?
17. Did you coordinate with other volunteers, community radio and/or government agencies in term of information sharing? If yes, how?
18. Did you find the practicality of JM Networks in evacuation and aid activities among volunteers, local communities, and local government? How?

SEMI-STRUCTURED INTERVIEW QUESTIONS
For Audience

1. How did you get reliable information about Merapi before and after the 2010 eruption?
2. As a part of the local community, what kind of information did you need most? Why?
3. How did you know about JM?
4. Did you trust JM? Why?
5. How did you use information from JM?
6. Did you share the information that you gained from JM? How?
7. How did you verify the information from JM when it asked you to help refugees or give donations?
8. What do you think about the compatibility between Jalin Merapi's media selection (Social media and community radio) and your media preference?
9. Did JM become an effective means to fulfill your information needs? Why? (Regarding media preference, accessibility, literacy, etc.).
10. How do you compare JM, other media (television, newspaper, etc.), and official source(s) regarding their trustworthiness and effectiveness? Why?

Department of Media and Communication
Telephone: +642108456842 (New Zealand), +628122732002 (Indonesia)
Email: dwie.gultom@pg.canterbury.ac.nz
February, 2014

Community-based Information Framework in Indonesian Natural Disaster Response
Information Sheet for Interviewees

I am a PhD candidate in University of Canterbury – New Zealand and also an official of Indonesian Institute of Sciences (LIPI). I am working on research about how local communities seek, provide, verify, and share information mediated by Jalin Merapi networks in responding to the 2010 Merapi eruption. Regarding to this research, I am asking for your willingness to participate in an interview.

Your involvement in this research will be as an informant to answer questions in a face to face interview for about 45-60 minutes. The questions will be related to your knowledge and participation experiences in information sharing mediated by Jalin Merapi in the 2010 Merapi eruption. The interview will be recorded. The transcript of the recording will be sent to you to be reviewed and you may amend your transcript. The full report or summary of research findings will also be sent to all interviewees who are interested in receiving a copy. A token of appreciation will be availabe to recompense interviewees' time.

Participation is voluntary and you have the right to withdraw at any stage without penalty. If you withdraw, I will remove information you have provided from the thesis before it is completed at the University of Canterbury

You also may choose whether you want your identity to be confidential or not. If you do not want to be confidential, your identity will be published. However, if you want to be confidential, you may be assured of the complete confidentiality of data gathered in this investigation. Your identity will not be made public without your prior consent. To ensure confidentiality, all participants' identities will be identified as numbers. All information will be kept confidential to the researcher in locked and secure room, stored in password protected computer and will be destroyed after ten years. The results of this research will be published and presented in conferences. The thesis that results from this research is a public document and it will be publicly available through the UC library.

The research is being carried out as a requirement for PhD degree by Dwie Irmawaty Gultom under the supervision of Dr Zita Joyce, who can be contacted at zita.joyce@canterbury.ac.nz. She will be pleased to discuss any concerns you may have about participation in the research. This research has been reviewed and approved by the University of Canterbury Human Ethics Committee, and participants should address any complaints to The Chair, Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz).

If you agree to participate in this study, you are asked to complete the consent form. Your participation will be highly appreciated.

Dwie Irmawaty Gultom

No	Interviewee's name	Group	Location	Age	Date
1	Adriani dwi kartika zulivan	JM Volunteer	Yogyakarta	31	17 March 2014
2	Akhmad nasir	Combine	Yogyakarta	38	17 March 2014
3	Ambar sari dewi	JM Volunteer	Yogyakarta	38	25 March 2014
4	Amron risdianto	JM Volunteer	Yogyakarta	35	18-Apr-14
5	Andi verdana	Community radio	Sleman	23	11 March 2014
6	Andry setiawan	JM audience	Klaten	32	5 June 2014
7	Arie nur pujiantoro	JM audience	Klaten	32	5 June 2014
8	Berton panjaitan	Government	Jakarta		03-Sep-14
9	Diah triasih agustina	JM Volunteer	Balikpapan	33	27 May 2014
10	Dini	Government	Jakarta		27 March 2014
11	Eko budi setyawan	Community radio	Magelang	47	20 March 2014
12	Elanto wijoyono	Combine	Yogyakarta	31	17 March 2014
13	Floribertha widyarsi	JM Volunteer	Yogyakarta	60	27 May 2014
14	Gimar	JM audience	Magelang	47	8 June 2014
15	Gunawan julianto	JM audience	Magelang	44	8 June 2014
16	Kurniawan widiyantoro	Community radio	Sleman	24	11 March 2014
17	Letsu vella sundary	JM Volunteer	Yogyakarta	22	21-Apr-14
18	Mart widarto	Combine	Yogyakarta	32	17 March 2014
19	Muhammad amrun	Combine	Yogyakarta	32	18-Apr-14
20	Muhammad sodiq asnawi	Community radio	Magelang	40	21 March 2014
21	Mujianto	Community radio	Boyolali		26-Apr-14
22	Nursanti retno ramawanti	JM audience	Sleman	37	24 July 2014
23	Pandu	Community radio	Magelang	23	21 March 2014
24	Putro setyo negoro	JM Volunteer	Yogyakarta	25	23-Apr-14
25	Rajab santosa	Community radio	Magelang	31	21 March 2014
26	Ratna wulandari	JM audience	Magelang	40	7 July 2014
27	Sarjino adji	JM audience	Klaten	36	22 July 2014
28	Setiyoko	JM audience	Magelang	26	8 June 2014
29	Son haji	Community radio	Magelang	35	21 March 2014
30	Sukiman	Community radio	Klaten	44	6 May 2014
31	Supadi	JM audience	Klaten	37	22 July 2014
32	Suryo purnomo	JM audience	Magelang	29	8 June 2014
33	Totok hartanto	Combine	Yogyakarta	30	12 March 2014
34	Wahyu kurniawan	JM Volunteer	Yogyakarta	27	18-Apr-14
35	Yando zakaria	JM audience	Sleman	55	26 June 2014
36	Focus group (7 participants)	Government	Magelang		19 June 2014
37	Focus group (7 participants)	Government	Sleman		19 July 2014

Appendix B: Focus group guidelines, information sheet, and invitation letters for the focus group interviews.

FOCUS GROUP QUESTIONS

1. How does the official disaster information flow between the government agencies in responding to Mt. Merapi eruption? Is there any legislative foundation?
2. How does the government decide which information that has to be prioritized to be disseminated to the public?
3. What is the supporting data required in the official disaster communication? Is there any agency who act as an accesible bank data for the public?
4. What is the media selection used in information dissemination, both between government agencies, and between the government agencies and the public? Why?
5. What is the roles of community radio stations dan the users of two-way radio in the official disaster communication? Are they treated as information sources or as information sources to deliver official information to the public?
6. How is the usage of internet-based media in the official disaster communication?
7. How does the government coordinate with and engage the local communities in the formal disaster response, particularly in disaster communication and decision-making?
8. How does the local government percieve the trustworthiness and the accuracy of community-based disaster communication?
9. How do you compare the information network of the government, mass media and community-based information network, regarding its efectiveness, accessibility, trustworthiness, and accuracy?
10. How is the consideration of the official disaster information-disclosure for the public, regarding the information type, the time, and the media selection?
11. How can community contribute in the process of decision making in formal disaster management?
12. What are the challenges in integrating the mechanism of community-based information network into the formal disaster responses?

Department of Media and Communication
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Email: dwie.gultom@pg.canterbury.ac.nz
February, 2014

Community-based Information Framework in Indonesian Natural Disaster Response
Information Sheet for Focus Group Participants

I am a PhD candidate in University of Canterbury – New Zealand and also an official of Indonesian Institute of Sciences (LIPI). I am working on research about how local communities seek, provide, verify, and share information mediated by Jalin Merapi networks in responding to the 2010 Merapi eruption. Regarding this research, I am asking for your willingness to participate in a focus group.

Your involvement in this research will be as a participant to answer and discuss questions in a focus group for up to 2 hours. The questions will be related to your knowledge and experiences in information sharing mediated by Jalin Merapi in the 2010 Merapi eruption. The discussion will focus on how community-based information can contribute to and be integrated into authorized responses in responding to a disaster. The focus group will be video recorded. The transcript of the recording will be sent to you to be reviewed and you may amend your transcript. The full report or summary of research findings will also be sent to all participants who are interested in receiving a copy. A token of appreciation will be availabe to recompense participants' time.

Participation is voluntary and you have the right to withdraw at any stage without penalty. If you withdraw, I will remove information you have provided from the thesis before it is completed at the University of Canterbury.

You also may choose whether you want your identity to be confidential or not. If you do not want to be confidential, your identity will be published. However, if you want to be confidential, you may be assured of the complete confidentiality of data gathered in this investigation. Your identity will not be made public without your prior consent. To ensure confidentiality, all participants' identities will be identified as numbers. All information will be kept confidential to the researcher in locked and secure room, stored in password protected computer and will be destroyed after ten years. The result of this research will be published and presented in conferences. The thesis that results from this research is a public document and it will be publicly available through the UC library.

The research is being carried out as a requirement for PhD degree by Dwie Irmawaty Gultom under the supervision of Dr Zita Joyce, who can be contacted at zita.joyce@canterbury.ac.nz. She will be pleased to discuss any concerns you may have about participation in the research. This research has been reviewed and approved by the University of Canterbury Human Ethics Committee, and participants should address any complaints to The Chair, Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz).

If you agree to participate in this study, you are asked to complete the consent form. Your participation will be highly appreciated.

Dwie Irmawaty Gultom

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Department of Media and Communication
University of Canterbury
Christchurch - New Zealand

January, 2014

Attention:
Kepala Badan Penanggulangan Bencana Daerah (BPBD)
Provinsi Daerah Istimewa Yogyakarta

Subject: Invitation to participate in focus group research.

Dear Sir/Madam,

I am writing on behalf of Dwie Irmawaty Gultom, to invite you to be a participant in focus group research to be conducted for her dissertation in the Department of Media and Communication, University of Canterbury. Her dissertation is titled "Community-based information framework in Indonesian Natural Disaster Response" and is under the supervision of Dr Zita Joyce.

The research aims to investigate how local communities seek, provide, and verify the information that was mediated by Jalin Merapi social media accounts in responding to the 2010 Merapi eruption. The research stresses the local community's roles and involvement based on their own knowledge, experiences and vulnerabilities, to acknowlege social media's challenges of continual organizing, monitoring of credibility, and additional verification on the formal response effort. In representing local needs, the research also examines community radio's involvement as a stimulus or mediator and combines this with social media's capabilities. Finally, this research investigates how community-based information sharing can contribute and be integrated in existing formal disaster response by local goverments as part of wider local communities.

The focus group will be held on:
Date :
Time :
Place :
If you are able to attend this focus group, please confirm your attendance to the researcher at HP: 08122732002 or email: dwie.gultom@pg.canterbury.ac.nz.

The results of this study will be used for her thesis which is publicly available through UC library, published in journals and presented in conferences. I enclose the research proposal, a list of indicative questions for semi-structured interviews and focus groups, and Human Ethics Committee approval for your further consideration. If you have any questions, please do not hesitate to contact me at email: lindajean.kenix@canterbury.ac.nz.

Your willingness to participate in this research will be appreciated.

Sincerely,

Assoc. Prof. Linda Jean Kenix
Head of Department of Media and Communication

Appendix C: Consent form for the research participants.

Department of Media and Communication
Telephone: +642108456842 (New Zealand), +628122732002 (Indonesia)
Email: dwie.gultom@pg.canterbury.ac.nz

Community-based Information Framework in Indonesian Natural Disaster Response
Consent Form for Confidential Participants

I have been given a full explanation of this research and have had the opportunity to ask questions.

I understand what is required of me if I agree to take part in the research.

I understand that participation is voluntary and I have the right to withdraw at any time without penalty. If I withdraw, information I have provided will be removed from the thesis before it is completed at the University of Canterbury.

I understand that any information or opinion I provide will be kept confidential to the researcher and that any published or reported results will not publish my identity or my institution. I understand that the thesis that results from this research is a public document and will be publicly available through the UC Library.

I understand that all data collected for the study will be kept in a locked and secure room, stored in password protected computer and will be destroyed after ten years.

I understand the there is no risk associated with taking part in this research.

I understand that I will receive the transcript of the recording and I am able to amend it.

I understand that if I am interested to have a copy of full report or summary of the research findings, I can ask the researcher to sent it to me.

I understand that I can contact the researcher (Dwie Irmawaty Gultom at dwie.gultom@pg.canterbury.ac.nz) or supervisor (Dr Zita Joyce at zita.joyce@canterbury.ac.nz) for futher information. If I have any complaints, I can contact the Chair of the University of Canterbury Human Ethics Committee, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz).

By signing below, I agree to participate in research project.

NAME:

Signature:

Date:

Department of Media and Communication
Telephone: +642108456842 (New Zealand), +628122732002 (Indonesia)
Email: dwie.gultom@pg.canterbury.ac.nz

Community-based Information Framework in Indonesian Natural Disaster Response
Consent Form for Non Confidential Participants

I have been given a full explanation of this research and have had the opportunity to ask questions.

I understand what is required of me if I agree to take part in the research.

I understand that participation is voluntary and I have the right to withdraw at any time without penalty. If I withdraw, information I have provided will be removed from the thesis before it is completed at the University of Canterbury.

I understand that any information or opinion I provide will not be kept confidential and that any published or reported results will publish my identity or my institution. I understand that the thesis that results from this research is a public document and will be publicly available through the UC Library.

I understand that all data collected for the study will be kept in a locked and secure room, stored in password protected computer and will be destroyed after ten years.

I understand the there is no risk associated with taking part in this research.

I understand that I will receive the transcript of the recording and I am able to amend it.

I understand that if I am interested to have a copy of full report or summary of the research findings, I can ask the researcher to sent it to me.

I understand that I can contact the researcher (Dwie Irmawaty Gultom at dwie.gultom@pg.canterbury.ac.nz) or supervisor (Dr Zita Joyce at zita.joyce@canterbury.ac.nz) for futher information. If I have any complaints, I can contact the Chair of the University of Canterbury Human Ethics Committee, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz).

By signing below, I agree to participate in research project.
NAME:
Signature:
Date:

Appendix D: The approval of Human Ethics Committee and the research permits of the Indonesian government.

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

HUMAN ETHICS COMMITTEE

Secretary, Lynda Griffioen
Email: human-ethics@canterbury.ac.nz

Ref: HEC 2013/144

18 December 2013

Dwie Gultom
Department of Media & Communication
UNIVERSITY OF CANTERBURY

Dear Dwie

The Human Ethics Committee advises that your research proposal "Community-based information framework in Indonesian natural disaster response" has been considered and approved.

Please note that this approval is subject to the incorporation of the amendments you have provided in your email of 29 November 2013.

Best wishes for your project.

Yours sincerely

Lindsey MacDonald
Chair
University of Canterbury Human Ethics Committee

HUMAN ETHICS COMMITTEE

Secretary, Lynda Griffioen
Email: human-ethics@canterbury.ac.nz

Ref: HEC 2013/144

13 June 2014

Irma Gultom
Department of Media & Communication
UNIVERSITY OF CANTERBURY

Dear Irma

Thank you for your request for an amendment to your research proposal "Community-based information framework in Indonesian natural disaster response" as outlined in the email from Zita Joyce dated 10 June 2014.

I am pleased to advise that this request has been considered and approved by the Human Ethics Committee.

Yours sincerely

Lindsey MacDonald
Chair, Human Ethics Committee

KEMENTERIAN DALAM NEGERI
REPUBLIK INDONESIA
DIREKTORAT JENDERAL KESATUAN BANGSA DAN POLITIK
Jl. Medan Merdeka Utara No. 7 Telp. (021) 3450038, Fax (021) 3454270, Jakarta 10110

Jakarta, 21 Januari 2014

Nomor : 070/0242/D.I
Lampiran : 1 (satu) berkas
Perihal : Rekomendasi Penelitian

Kepada
Yth. Gubernur Jawa Tengah dan D.I. Yogyakarta.
u.p. Kepala Badan Kesbangpol dan Linmas

Dalam rangka memperlancar pelaksanaan kegiatan penelitian bersama ini terlampir disampaikan Rekomendasi Penelitian Nomor 460.02/0151. D.I Tanggal 17 Januari 2014 atas nama Dwie Irmawaty Gultom dengan judul proposal Informasi Berbasis Masyarakat Dalam Merespon Bencana Alam di Indonesia *(community-based Information framework in Indonesia natural disaster response)* di Provinsi Jawa Tengah dan D.I. Yogyakarta, untuk dapat ditindaklanjuti.

Demikian untuk menjadi maklum dan terima kasih.

a.n. DIREKTUR JENDERAL
KESATUAN BANGSA DAN POLITIK
SEKRETARIS DITJEN,

INDRA LASKORO
Pembina Utama Madya (IV/d)
NIP. 19600925 198503 1 001

Tembusan :
Yth. Bapak Dirjen Kesbangpol, sebagai laporan.

KEMENTERIAN DALAM NEGERI
REPUBLIK INDONESIA

REKOMENDASI PENELITIAN
NOMOR 460.02/0151.D.I

a. Dasar : 1. Peraturan Menteri Dalam Negeri Nomor 41 Tahun 2010 tentang Organisasi dan Tata Kerja Kementerian Dalam Negeri (Berita Negara Republik Indonesia Tahun 2010 Nomor 316), sebagaimana telah diubah dengan Peraturan Menteri Dalam Negeri Nomor 14 Tahun 2011 tentang Perubahan Atas Peraturan Menteri Dalam Negeri Nomor 41 Tahun 2010 tentang Organisasi dan Tata Kerja Kementerian Dalam Negeri (Berita Negara Republik Indonesia Tahun 2011 Nomor 168);

2. Peraturan Menteri Dalam Negeri Nomor 64 Tahun 2011 tentang Pedoman Penerbitan Rekomendasi Penelitian.

b. Menimbang : Surat Kepala Bagian Humas Lembaga Ilmu Pengetahuan Indonesia *(Indonesian institute of sciences)* Nomor 01/SU.303/HM/I/2014 Tanggal 9 Januari 2014 Perihal Permohonan Ijin Penelitian.

MENTERI DALAM NEGERI, memberikan rekomendasi pada:

a. Nama/Obyek : Dwie Irmawaty Gultom.

b. Jabatan/Tempat/ Identitas : Peneliti Utama/ Sasana Widya Sarwono Jl. Jenderal Gatot Subroto No. 10, Jakarta 12710 Telp. (021) 5225711, 5251542/No. KTP 3674093650583000.

c. Untuk : 1) Melakukan penelitian, dengan proposal berjudul Informasi Barbasis Masyarakat Dalam Merespon Bencana alam di Indonesia *(community-based information framework in Indonesia natural disaster response);*

2) Lokasi penelitian: Provinsi Jawa Tengah dan D.I. Yogyakarta (2 provinsi).

3) Waktu/Lama penelitian: Februari s.d. Juli 2014.

4) Anggota tim peneliti: -

5) Bidang penelitian : Sosial;

6) Status penelitian : Baru.

Demikian rekomendasi ini dibuat untuk digunakan seperlunya.

Jakarta, 17 Januari 2014
a.n. MENTERI DALAM NEGERI
DIREKTUR JENDERAL
KESATUAN BANGSA DAN POLITIK

A. TAUFIKBALI L.

PEMERINTAH DAERAH DAERAH ISTIMEWA YOGYAKARTA
BADAN KESATUAN BANGSA DAN PERLINDUNGAN MASYARAKAT
(BADAN KESBANGLINMAS)
Jl. Jenderal Sudirman No 5 Yogyakarta - 55233
Telepon : (0274) 551136, 551275, Fax (0274) 551137
YOGYAKARTA

Yogyakarta, 24 Februari 2014

Nomor : 074 / 539 / Kesbang / 2014
Perihal : Rekomendasi Izin Penelitian

Kepada Yth. :
Bupati Sleman
Up. Kepala Kantor Kesbang
Kabupaten Sleman
Di
BERAN

Memperhatikan surat :

Dari	:	Dirjen Kesbangpol Kementerian dalam Negeri RI
Nomor	:	070/0242.D.I
Tanggal	:	21 Januari 2014
Perihal	:	Rekomendasi Penelitian

Setelah mempelajari surat pemberitahuan dan proposal yang diajukan, maka dapat diberikan surat rekomendasi tidak keberatan untuk melaksanakan penelitian dengan judul proposal : **" INFORMASI BERBASIS MASYARAKAT DALAM MERESPON BENCANA ALAM DI INDONESIA ",** kepada :

Nama	:	DWIE IRMAWATY GULTOM
Jabatan	:	Peneliti Utama
Alamat	:	Sasana Widya Sarwono Jl. Jend. Gatot Subroto No. 10, Jakarta 12710 Telp. (021) 5225711
Institusi	:	Lembaga Ilmu Pengetahuan Indonesia (LIPI)
Lokasi	:	Kabupaten Sleman, DIY
Waktu	:	Pebruari s.d Juli 2014

Sehubungan dengan maksud tersebut, diharapkan agar pihak yang terkait dapat memberikan bantuan / fasilitas yang dibutuhkan.

Kepada yang bersangkutan diwajibkan :
1. Menghormati dan mentaati peraturan dan tata tertib yang berlaku di wilayah riset / penelitian;
2. Tidak dibenarkan melakukan riset / penelitian yang tidak sesuai atau tidak ada kaitannya dengan judul riset / penelitian dimaksud;
3. Melaporkan hasil riset / penelitian kepada Badan Kesbanglinmas DIY.

Rekomendasi Ijin Riset / Penelitian ini dinyatakan tidak berlaku, apabila ternyata pemegang tidak mentaati ketentuan tersebut di atas.

Demikian untuk menjadikan maklum.

A.n. KEPALA
BADAN KESBANGLINMAS DIY
KABID KESBANG

PEMERINTAH DAERAH ISTIMEWA YOGYAKARTA
BADAN KESBANGLINMAS

RUSDIYANTO
NIP 19621029 199003 1 004

Tembusan disampaikan Kepada Yth :
1. Gubernur DIY (sebagai laporan);
2. Yang bersangkutan.

PEMERINTAH PROVINSI JAWA TENGAH
BADAN PENANAMAN MODAL DAERAH
Alamat : Jl. Mgr. Soegiopranoto No. 1 Telepon : (024) 3547091 - 3547438 - 3541487
Fax : (024) 3549560 http : // bpmd.jatengprov.go.id e-mail : bpmd@jatengprov.go.id
Semarang - 50131

REKOMENDASI PENELITIAN
NOMOR : 070/467/04.5/2014

Dasar : 1. Peraturan Menteri Dalam Negeri Republik Indonesia Nomor 64 Tahun 2011 tanggal 20 Desember 2011 tentang Pedoman Penerbitan Rekomendasi Penelitian;
2. Peraturan Gubernur No. 74 Tahun 2012 tentang Organisasi dan Tata kerja Unit Pelaksana Teknis Pelayanan Terpadu Satu Pintu Pada Badan Penanaman Modal Daerah Provinsi Jawa Tengah;
3. Peraturan Gubernur No. 67 Tahun 2013 tentang Penyelenggaraan Pelayanan Terpadu Satu Pintu Provinsi Jawa Tengah.

Menimbang : 1. Surat Kepala Bagian Humas Lembaga Ilmu Pengetahuan Indonesia No. 04/Su.303/HM/I/2014 tanggal : Januari 2014 perihal Permohonan Izin Penelitian.
2. Surat Head of Department of Media and Communication University of Canterbury Christchurch-New Zealand tanggal : Januari 2014 Perihal : Permission to conduct a research study.
3. Surat Dirjen Kesbangpol Kementerian Dalam Negeri Republik Indonesia No : 070/0242.D.I tanggal : 21 Januari 2014 perihal : Rekomendasi Penelitian.

Kepala Badan Penanaman Modal Daerah Provinsi Jawa Tengah atas nama Gubernur Jawa Tengah, memberikan rekomendasi kepada :

1. Nama : DWIE IRMAWATI GULTOM, M.Si.
2. Kebangsaan : Indonesia.
3. Alamat : Komp. Mahagoni Park B1 No. 60 RT.001/ RW.007, Desa Perigi Baru, Kecamatan Pondok Aren, Kota Tangerang Selatan, Provinsi Banten.
4. Pekerjaan : Pegawai Negeri Sipil/ Mahasiswa S3.
5. Judul Penelitian : INFORMASI BERBASIS MASYARAKAT DALAM MERESPON BENCANA ALAM DI INDONESIA (*community-based Information framework in Indonesia natural disaster response).*
6. Tempat /Lokasi : Kabupaten Klaten, Kabupaten Boyolali, Kabupaten Magelang Provinsi Jawa Tengah.
7. Bidang Penelitian : Sosial.
8. Penanggung Jawab : Dr. Zita Joyce.
9. Anggota Peneliti : -
10. Nama Lembaga : 1. Lembaga Ilmu Pengetahuan Indonesia.
2. University of Canterbury Christchurch-New Zeala

Untuk : **Melakukan penelitian dalam rangka penyusunan disertasi dengan judul proposal : "INFORMASI BERBASIS MASYARAKAT DALAM MERESPON BENCANA ALAM DI INDONESIA (*community-based Information framework in Indonesia natural disaster response).*"**

UPT PTSP BPMD Prov. Jateng 26/02/2014

Nomor : 070/ /04. /2014
Halaman : 2 (3)

dengan ketentuan sebagai berikut :

1. Sebelum melakukan kegiatan terlebih dahulu melaporkan kepada Pejabat setempat / Lembaga swasta yang akan dijadikan obyek lokasi untuk mendapatkan petunjuk seperlunya dengan menunjukkan Surat Rekomendasi ini.
2. Pelaksanaan survey / riset tidak disalahgunakan untuk tujuan tertentu yang dapat mengganggu kestabilan pemerintahan. Untuk penelitian yang mendapat dukungan dana dari sponsor baik dari dalam negeri maupun luar negeri, agar dijelaskan pada saat mengajukan perizinan. Materi penelitian tidak membahas masalah politik dan /atau agama yang dapat menimbulkan terganggunya stabilitas keamanan dan ketertiban.
3. Surat rekomendasi dapat dicabut dan dinyatakan tidak berlaku apabila pemegang surat rekomendasi ini dalam melaksanakan penelitian tidak sesuai dengan surat permohonan beserta data dan berkasnya, tidak mentaati ketentuan yang tercantum dalam rekomendasi penelitian, peraturan perundang-undangan, norma-norma atau adat istiadat yang berlaku, dan penelitian yang dilaksanakan dapat menimbulkan keresahan di masyarakat, disintegrasi bangsa atau keutuhan NKRI.
4. Pencabutan sanksi atau pemberlakuan kembali rekomendasi penelitian dapat diberlakukan kembali apabila telah dilakukan klarifikasi dan atau pemantauan di daerah lokasi penelitian dilaksanakan dan adanya surat pernyataan dari peneliti kepada pejabat yang menerbitkan rekomendasi penelitian untuk tidak lagi melanggar ketentuan yang berlaku.
5. Setelah survai/riset/penelitian selesai supaya menyerahkan hasil survai/riset/penelitian kepada Kepala Badan Penanaman Modal Daerah Provinsi Jawa Tengah.
6. Surat Rekomendasi Penelitian ini berlaku pada tanggal 26 Februari 2014 s.d. Juli 2014.
7. Surat Rekomendasi ini dapat diubah apabila di kemudian hari terdapat kekeliruan dan akan diadakan perbaikan sebagaimana mestinya.

Ditetapkan di : Semarang.
Pada tanggal : 26 Februari 2014.

a.n. GUBERNUR JAWA TENGAH
KEPALA BADAN PENANAMAN MODAL DAERAH
PROVINSI JAWA TENGAH

PEMERINTAH PROVINSI JAWA TENGAH
BPMD

Ir. YUNI ASTUTI, MA.
Pembina Utama Muda
NIP. 19620621 198709 2 001

Tembusan :

1. Kepala Badan Kesbangpol dan Linmas Provinsi Jawa Tengah;
2. Kepala Kantor Kesbangpol Kab. Klaten;

UPT PTSP BPMD Prov. Jateng 26/02/2014

Nomor : 070/ /04. /2014
Halaman : 3 (3)

3. Kepala Kantor Kesbangpol Kab. Boyolali;
4. Kepala Kantor Kesbangpol Kab. Magelang;
5. Kepala Lembaga Ilmu Pengetahuan Indonesia;
6. Rector Of University of Canterbury Christchurch-New Zealand;
7. Sdr. DWIE IRMAWATI GULTOM, M.Si;
8. Arsip.

UPT PTSP BPMD Prov. Jateng 26/02/2014

PEMERINTAH KABUPATEN MAGELANG

BADAN PENANAMAN MODAL
DAN PELAYANAN PERIZINAN TERPADU

Jl. Soekarno Hatta No. 20 (0293) 788249 Faks 789549
Kota Mungkid 56511

Kota Mungkid, 20 Maret 2014

Nomor : 070 / 99 / 59 / 2014
Sifat : Amat segera
Perihal : Izin Penelitian

Kepada :
Yth. **DWIE IRMAWATI GULTOM**
Komplek Mahagoni Park B1 No. 60 RT 01 RW 007,Kel. Perigi Baru, Kec. Pondok Aren Kota Tangerang Selatan Prov Banten
di
BANTEN

Dasar : Surat Kepala Kantor Kesatuan BangsaDan Politik KabupatenMagelang Nomor : 070/140/14/2014 tanggal 6 Maret 2014. Perihal Rekomendasi izin Penelitian/Riset/Survey/PKL di Kabupaten Magelang

Dengan ini kami tidak keberatan dan menyetujui atas pelaksanaan izin Penelitian / Riset / Survey / PKL di Kabupaten Magelang yang akan dilaksanakan oleh Saudara :

Nama	:	**DWIE IRMAWATI GULTOM**
Pekerjaan	:	Mahasiswi, University Of Canterbury
Alamat	:	Komplek Mahagoni Park B1 No. 60 RT 01 RW 007,Kel. Perigi Baru, Kec. Pondok Aren Kota Tangerang Selatan Prov Banten
Penanggung Jawab	:	**Dr. Zita Joyce**
Pekerjaan	:	Dosen
Lokasi	:	Kabupaten Magelang
Waktu	:	Maret s/d Juni 2014
Peserta	:	-
Tujuan	:	Mengadakan Penelitian dengan Judul : ***" INFORMASI BERBASIS MASYARAKAT DALAM MERESPON BENCANA DI INDONESIA (COMMUNITY-BASED INFORMATION FRAMEWORK IN INDONESIA NATURAL DISASTER RESPONSE) "***

Sebelum Melaksanakan Kegiatan Praktek Profesi agar Saudara Mengikuti ketentuan-ketentuan sebagai berikut :

1. Melapor kepada Pejabat Pemerintah setempat untuk mendapat petunjuk seperlunya.
2. Wajib menjaga tata tertib dan mentaati ketentuan-ketentuan yang berlaku.
3. Surat izin dapat dicabut dan dinyatakan tidak berlaku, apabila pemegang surat ini tidak mentaati / mengindahkan peraturan yang berlaku.

Demikian untuk menjadikan periksa dan guna seperlunya.

Plt. KEPALA BADAN PENANAMAN MODAL DAN PELAYANAN PERIZINAN TERPADU KABUPATEN MAGELANG
Sekretaris

SULISTYO YUWONO,SH.
Pembina Tk I
NIP. 19680731199403 1 009

TEMBUSAN :
1. Bupati Magelang
2. Kepala Badan/ Dinas,Kantor/Instansi terkait

PEMERINTAH KABUPATEN KLATEN
BADAN PERENCANAAN PEMBANGUNAN DAERAH
(BAPPEDA)

Jl. Pemuda No. 294 Gedung Pemda II Lt. 2 Telp. (0272)321046 Psw 314–318 Faks 328730
KLATEN 57424

Nomor : 072/774/VII/09
Lampiran : -
Perihal : ***Permohonan Ijin Penelitian***

Klaten, 6 Juli 2014
Kepada Yth.
Ka. Desa Sidorejo

D i –
KLATEN

Menunjuk Surat dari Badan Penanaman Modal Daerah Prov. Jateng No 070/457/04.5/2014 Tgl. 26 Februari 2014 Perihal Permohonan Ijin Penelitian, dengan hormat kami beritahukan bahwa di Wilayah/Instansi Saudara akan dilaksanakan Penelitian oleh :

Nama		Dwie Irmawaty Gultom, MSi
Alamat	:	Kamp. Mahoni Park B1 No. 60 RT.oo1/RW.007, Desa Prigi Baru Tangeran Selatan
Pekerjaan	:	PNS/ Mahasiswa S3
Penanggungjawab	:	Dr. Zita Joyce
Judul/topik	:	Informasi Berbasis Masyarakat Dalam Merespon Bencana Alam di Indonesia
Jangka Waktu	:	6 Bl. (1 Februari - 30 Juli 2014)
Catatan	:	Menyerahkan Hasil Penelitian Berupa ***Hard Copy*** Dan ***Soft Copy*** Ke Bidang PEPP/ Litbang BAPPEDA Kabupaten Klaten

Besar harapan kami, agar berkenan memberikan bantuan seperlunya.

An. BUPATI KLATEN
Kepala BAPPEDA Kabupaten Klaten
Up. Sekretaris

PEMERINTAH KABUPATEN KLATEN
BADAN PERENCANAAN PEMBANGUNAN DAERAH

Hari Budiono, SH
Pembina Tingkat I
NIP. 19611008 198812 1 001

Tembusan disampaikan Kepada Yth :
1. Ka. Kantor Kesbangpol Kab. Klaten
2. Camat Kemalang
3. Kepala Lembaga Ilmu Pengetahuan Indonesia
4. University Of Canterbury
5. Yang Bersangkutan
6. Arsip

PEMERINTAH KABUPATEN SLEMAN
BADAN PERENCANAAN PEMBANGUNAN DAERAH
Jalan Parasamya Nomor 1 Beran, Tridadi, Sleman, Yogyakarta 55511
Telepon (0274) 868800, Faksimilie (0274) 868800
Website: slemankab.go.id, E-mail : bappeda@slemankab.go.id

SURAT IZIN

Nomor : 070 / Bappeda / 733 / 2014

TENTANG
PENELITIAN

KEPALA BADAN PERENCANAAN PEMBANGUNAN DAERAH

Dasar : Peraturan Bupati Sleman Nomor : 45 Tahun 2013 Tentang Izin Penelitian, Izin Kuliah Kerja Nyata, Dan Izin Praktik Kerja Lapangan.

Menunjuk : Surat dari Kepala Kantor Kesatuan Bangsa Kab. Sleman
Nomor : 070/Kesbang/711/2014 Tanggal : 25 Februari 2014
Hal : Rekomendasi Penelitian

MENGIZINKAN :

Kepada	:
Nama	: DWIE IRMAWATY GULTOM
No.Mhs/NIM/NIP/NIK	: 34925150
Program/Tingkat	: S3
Instansi/Perguruan Tinggi	: University Of Canterbury New Zaeland
Alamat instansi/Perguruan Tinggi	: Christchurch - New Zealand
Alamat Rumah	: Bantulan Janti Yogyakarta
No. Telp / HP	: 08122732002
Untuk	: Mengadakan Penelitian / Pra Survey / Uji Validitas / PKL dengan judul **INFORMASI BERBASIS MASYARAKAT DALAM MERESPON BENCANA ALAM DI INDONESIA**
Lokasi	: Kecamatan Cangkringan
Waktu	: Selama 3 bulan mulai tanggal: 25 Februari 2014 s/d 25 Mei 2014

Dengan ketentuan sebagai berikut :

1. *Wajib melapor diri kepada Pejabat Pemerintah setempat (Camat/ Kepala Desa) atau Kepala Instansi untuk mendapat petunjuk seperlunya.*
2. *Wajib menjaga tata tertib dan mentaati ketentuan-ketentuan setempat yang berlaku.*
3. *Izin tidak disalahgunakan untuk kepentingan-kepentingan di luar yang direkomendasikan.*
4. *Wajib menyampaikan laporan hasil penelitian berupa 1 (satu) CD format PDF kepada Bupati diserahkan melalui Kepala Badan Perencanaan Pembangunan Daerah.*
5. *Izin ini dapat dibatalkan sewaktu-waktu apabila tidak dipenuhi ketentuan-ketentuan di atas.*

Demikian ijin ini dikeluarkan untuk digunakan sebagaimana mestinya, diharapkan pejabat pemerintah/non pemerintah setempat memberikan bantuan seperlunya.

Setelah selesai pelaksanaan penelitian Saudara wajib menyampaikan laporan kepada kami 1 (satu) bulan setelah berakhirnya penelitian.

Dikeluarkan di Sleman
Pada Tanggal : 25 Februari 2014
a.n. Kepala Badan Perencanaan Pembangunan Daerah
Sekretaris
u.b.
Kepala Bidang Pengendalian dan Evaluasi

PEMERINTAH KABUPATEN SLEMAN
BADAN PERENCANAAN PEMBANGUNAN DAERAH

Dra. SUCI IRIANI SINURAYA, M.Si, MM
Pembina, IV/a
NIP 19630112 198903 2 003

Tembusan :
1. Bupati Sleman (sebagai laporan)
2. Kepala BPBD Kab. Sleman
3. Kabid. Perdesaan Bappeda Kab. Sleman
4. Camat Cangkringan
5. Rektor University Of Canterbury New Zealand
6. Yang Bersangkutan

PEMERINTAH KABUPATEN MAGELANG

KANTOR KESATUAN BANGSA DAN POLITIK

Jl. Soekarno-Hatta No. 007, ☎ (0293) 788616

KOTA MUNGKID 56511

Kota Mungkid, 6 Maret 2014.

Nomor : 070 / 140 / 14 / 2014
Lampiran : -
Perihal : Rekomendasi.

Kepada :
Yth, Kepala Badan Penanaman Modal dan Pelayanan Perijinan Terpadu Kabupaten Magelang.

Di -
KOTA MUNGKID

1. Dasar : Surat dari BPMD Jawa Tengah
   Nomor : 070/451/045/2014
   Tanggal : 26 Pebruari 2014.
   Tentang : Rekomendasi Penelitian

2. Dengan hormat diberitahukan bahwa kami tidak keberatan atas pelaksanaan Penelitian/Riset/Survey/PKL di Kabupaten Magelang yang dilakukan oleh :

   a. N a m a : DWIE IRMAWATI GULTOM, M. Si
   b. Pekerjaan : Mahasiswi.
   c. Alamat : Komp Mahagoni Park B1 No.60 RT.001/RW.007, Ds. Perigi Baru, Kec.Pondok Aren, Kota Tangerang Selatan, Prov. Banten.
   d. Penanggung Jawab : Dr. ZITA JOYCE
   e. Lokasi : Kabupaten Magelang
   f. W a k t u : Pebruari s/d Juli 2014
   g. Tujuan : Mengadakan penelitian/Survey dengan judul :

   " ***INFORMASI BERBASIS MASYARAKAT DALAM MERESPON BENCANA ALAM DI INDONESIA (community-based information framework in Indonesia natural disaster response)*** "

3. Sebelum melakukan kegiatan, terlebih dahulu melaporkan kepada Pejabat Pemerintah setempat untuk mendapat petunjuk seperlunya.

4. Pelaksanaan Penelitian/Survey/Riset tidak disalah gunakan untuk tujuan tertentu yang dapat mengganggu kestabilan pemerintahan, dan tidak membahas masalah politik dan/atau agama yang dapat menimbulkan terganggunya stabilitas keamanan dan ketertiban.

5. Setelah pelaksanaan selesai agar menyerahkan hasilnya kepada Kantor Kesatuan Bangsa dan Politik Kabupaten Magelang.

6. Surat Rekomendasi ini dapat dicabut dan dinyatakan tidak berlaku apabila pemegang surat ini tidak mentaati / mengindahkan peraturan yang berlaku.

Demikian untuk menjadikan periksa dan guna seperlunya.

An. KEPALA KANTOR KESBANGPOL
KABUPATEN MAGELANG
Kepala Seksi Politik dan Kewaspadaan Nasional

PEMERINTAH KABUPATEN MAGELANG
KANTOR KESATUAN BANGSA DAN POLITIK

WARDI SUTRISNO, BA
Penata Tk. I
NIP. 19590205 198503 1 01

Tembusan,
1. Bp. Bupati Magelang (sebagai laporan).

PEMERINTAH KABUPATEN SLEMAN

KANTOR KESATUAN BANGSA

Beran, Tridadi, Sleman, Yogyakarta, 55511
Telepon (0274) 864650, Faksimile (0274) 864650
Website: www.slemankab.go.id, E-mail: kesbang.sleman@yahoo.com

Sleman, 25 Februari 2014

Nomor : 070 /Kesbang/ 211 /2014
Hal : Rekomendasi Penelitian

Kepada
Yth. Kepala Bappeda
Kabupaten Sleman
di Sleman

REKOMENDASI

Memperhatikan surat :

Dari	: Kabid Kesbang
Nomor	: 074/539/Kesbang/2014
Tanggal	: 24 Februari 2014
Perihal	: Permohonan Ijin Penelitian

Setelah mempelajari surat permohonan dan proposal yang diajukan, maka dapat diberikan rekomendasi dan tidak keberatan untuk melaksanakan penelitian dengan judul " **INFORMASI BERBASIS MASYARAKAT DALAM MERESPON BENCANA ALAM DI INDONESIA**" kepada:

Nama	: Dwie Irmawaty Gultom
Alamat Rumah	: Bantulan Janti Yogyakarta
No. Telepon	: 08122732002
Universitas / Fakultas	: University Of Canterbury
NIM	: 34925150
Program Studi	: S3
Alamat Universitas	: Christchurch-New Zealand
Lokasi Penelitian	: Kabupaten Sleman
Waktu	: 25 Februari - 25 Mei 2014

Yang bersangkutan berkewajiban menghormati dan menaati peraturan serta tata tertib yang berlaku di wilayah penelitian. Demikian untuk dipergunakan sebagaimana mestinya.

an. Kepala Kantor Kesatuan Bangsa
ub. Kepala Subbag Tata Usaha

Widodo Wuryanto, S.IP, M.Si
Penata Tingkat I, III/d
NIP 19701204 199009 1 001

PEMERINTAH KABUPATEN BOYOLALI

KANTOR KESATUAN BANGSA DAN POLITIK (KANTOR KESBANG POL)

Jalan Jambu Nomor 59 Telpon (0276) 321087 Siswodipuran Boyolali 57311

SURAT REKOMENDASI PENELITIAN
NOMOR : 070 / 400 / VII / 32 / 2014

I. DASAR :
1. Peraturan Menteri Dalam Negeri Republik Indonesia. Nomor 64 Tahun 2011. Tanggal 20 Desember 2011 Tentang Pedoman Penerbitan Rekomendasi Penelitian.
2. *Surat Edaran Gubernur Jawa Tengah Nomor 070/265/2004. Tanggal 20 Februari* 2004 Tentang Penyederhanaan Prosedur Permohonan Riset, KKN, PKL di Jawa Tengah.

II. MEMBACA : Surat dari Lembaga Ilmu Pengetahuan Indonesia Nomor: 05/SU.303/HM/I/2014 tanggal, Januari 2014 Perihal : Permohonan Ijin Penelitian.

III Prinsipnya TIDAK KEBERATAN / Dapat Menerima atas pelaksanaan Penelitian di Kabupaten Boyolali.

1.	N a m a / NIM	:	**DWIE IRMAWATY GULTOM**
2.	Alamat	:	Mahagoni Park B1/60, Bintaro Jaya - Tangerang
3.	Pekerjaan	:	Mahasiswa S3
4.	Penanggung Jawab	:	Dr Zita Joyce
5.	Judul Penelitian	:	**" COMMUNITY-BASED INFORMATION FRAMEWORK IN INDONESIAN NATURAL DISASTER RESPONSE "**
6	L o k a s i	:	Kecamatan Selo - Boyolali
7.	Peserta	:	1 Orang

IV Ketentuan-ketentuan sebagai berikut :
1. Sebelum melakukan kegiatan terlebih dahulu melaporkan kepada Pejabat Setempat / Lembaga Swasta yang akan dijadikan objek lokasi untuk mendapatkan petunjuk seperlunya dengan menunjukkan Surat Pemberitahuan ini.
2. Pelaksanaan Penelitian tidak di salahgunakan untuk tujuan tertentu yang dapat mengganggu kestabilan pemerintahan. Untuk penelitian yang mendapat dukungan dana dari sponsor baik dari dalam negeri maupun luar negeri, agar dijelaskan pada saat mengajukan perijinan. Tidak membahas masalah politik dan / atau agama yang dapat menimbulkan terganggunya stabilitas keamanan dan ketertiban.
3. Surat Rekomendasi dapat dicabut dan dinyatakan tidak berlaku apabila pemegang Surat Rekomendasi ini tidak mentaati / mengindahkan peraturan yang berlaku atau obyek penelitian menolak untuk menerima Peneliti.
4. Setelah Penelitian selesai, supaya menyerahkan hasilnya kepada Kantor Kesatuan Bangsa dan Politik Kabupaten Boyolali.

IV Surat Rekomendasi Penelitian berlaku

1.	Berlaku	:	Dari tanggal	: 15 Juli 2014	S/d tanggal	: 15 September 2014
2.	Perpanjangan	:	Dari tanggal	: ---	S/d tanggal	: ---

Dikeluarkan di : B O Y O L A L I
Pada tanggal : 15 Juli 2014

KEPALA KANTOR KESBANGPOL
KABUPATEN BOYOLALI

SUPAMA HARJA, S. Sos
Pembina Tingkat 1
NIP.19650502 198702 1'001

TEMBUSAN *Kepada Yth :*
1. Bupati Boyolali (sebagai laporan);
2. Dandim 0724 Boyolali;
3. Kapolres Boyolali;
4. Kepala Bappeda Kab. Boyolali;
5. Camat Kecamatan Selo;
6. Kepala Desa Samiran;
7. Kepala Lembaga Ilmu Pengetahuan Indonesia;
8. Rektor University of Canterbury;
9. Yang Bersangkutan,